



June 2015 Public Health Live!
Pediatric CT Scans, Radiation and Risks: Having an Informed Dialogue
Transcript

Moderator: Today's program is "Pediatric CT Scans, Radiation and Risks: Having an Informed Dialogue," and our guest is Dr. Donald Frush, a Professor of Radiology at the Duke University Medical Center. Thank you very much for joining us.

>> Introductory video clip

Moderator: Dr. Frush, I wonder if to get started you would share with us why the topic of radiation and risks are so important to you?

Dr. Frush: Well, thank you. It's a pleasure to be here, and first of all, let me say that medical radiation is extremely important in the care of children and adults. It's one of the most significant discoveries of the last century, but it does involve the use of radiation and I consider the use of radiation, as with any doctor's use of a material, to be that overdosing or underdoing should be considered in error.

Moderator: So is there a risk association crated with overexposure to radiation then?

Frush: Well, we've known for a long time that shortly after the discovery of x-rays in the late 1800's that x-rays, or radiation, could cause some harm. As you can see in this one child who actually had a fluoroscope or a schiascope held up to his head, had loss of hair. And high doses can cause that. We learned that early on and have taken steps over the subsequent decades to minimize the amount of radiation that our patients are exposed to.

Moderator: That was a long time ago. Is the high-dose radiation still an issue that's going on currently?

Frush: Well, Rachel, that's a great question. We're much better now than we were a hundred years ago, but there are still situations in which high dose radiation is given and people are exposed to. You can see in this situation on the slide where a couple of individuals have had some hair loss in an unusual distribution that was a result of a CT scan of the brain looking for stroke that was done incorrectly. So that was an unnecessarily high exposure for these individuals.

Moderator: So if something is more of an extreme dose, it poses an higher risk, is that an accurate representation of what you're saying?

Frush: That's correct. We know with really high doses of radiation like that used to treat cancer has some effects. It's supposed to treat the cancer, but with those very high doses, other effects can happen, including hair loss, skin erythema and so on. I have to emphasize that those are very high doses.

Moderator: So when you have those extreme doses, we've got that situation. Now, where should radiation from CT be in terms of risk?

Frush: What is important for people to understand is that very high doses are what are causing hair loss and so on. But most of what we deal with is *diagnostic* or low-levels of radiation that are very low on that risk curve. As you and the audience can see in this graph of risks on the vertical axis versus exposure on the horizontal axis and when we get to the high doses where those error bars are is where we see biological effects. We don't know what happens below that down to the zero point, and almost all radiation we use in diagnostic imaging is actually in that blue circle. So it's very low compared to what we consider high dose

Moderator: how do different medical imaging test compare with regard to different radiation doses?

Frush: If we look at that slide, all of the tests show very low doses; there are going to be some studies which are higher doses than others. For example, X-rays of the wrist or x-rays of the ankle have a very low radiation exposure and CT scans tend to be higher radiation exposure than those, but again, all of this is still a very low exposure.

Moderator: So we're talking a lot about high exposure-low exposure and varying dosages and that this might not be as important a consideration if we weren't doing CT scans very frequently. But can you give us information so we know about how many CT scans we are seeing each year in the U.S.?

Frush: Well, we do a lot of CT examinations in the United States. The numbers are anywhere from 82 to 85 million examinations per year and some of these examinations can be what we call double scans, where two phases are done; that is, two runs through when contrast material or dye is administered to individuals. Each of those runs might have an additional exposure. So if we just look at the numbers, that means about 120 million different exposures, and with the U.S. population being over 300 million, that equates to about one CT scan for every three people in the United States per year, and even more conservatively, one CT scan for every ten people in the United States per year. So that's why this rises to the level of, I think, public concern, because we *do* do a lot of imaging, even though the radiation dose for CT scans is relatively low compared to higher doses from other imaging.

Moderator: Sure. Still, it doesn't seem like a very rare occurrence, does it?

Frush: That's correct. That's correct.

Moderator: Given what we know about the higher numbers of CT testing, how would you compare the radiation exposure that one gets from CT testing to other potential radiation exposures?

Frush: It's important to understand, too, that we've been talking about medical radiation, medical exposure, but people are exposed to radiation all the time out in the sun, at higher altitudes, and things we eat have naturally occurring radiation. Generally about half of the

radiation that individuals get every year is just from what we call these natural sources or background sources. But [we raise concern] because we do a lot of CT examinations. For example, if you look at the pie chart here [on the slide], CT scans account for about 25% of all the radiation that the population of the United States gets every year.

Moderator: Twenty-five percent is a pretty sizable percentage. Why is there so much CT testing being done?

Frush: Well, there are many reasons that CT examinations are done, and we can talk a little bit about those. Again, I want to emphasize that CT is incredibly valuable in helping doctors make decisions in an emergency settings, and in non-emergency settings, about their patients' healthcare.

Moderator: Can you give us an example of when it might be beneficial to do a CT scan?

Frush: Sure. For example, CT scans are used commonly in the setting of trauma to see if there's injury to the brain or the spine or the internal organs. CT is used for diagnosis and follow up of cancer, is a very helpful modality. CT is also used in say a setting of a child in abdominal pain, appendicitis is common in children. Ultrasound sometimes doesn't give the information needed and CT information can be very helpful. As you can see on the image on the slide, the picture on the right side, where the arrows are, that long, worm-like structure there is an inflamed appendix, and that helps the physician know right away what the disposition of the child should be - whether they need surgery or not. So it's a very helpful modality. And there are other reasons why they are used frequently.

Moderator: Do you want to elaborate on any of those other reasons?

Frush: There are a number of them, but one reason is probably related to what is called self-referral. That is, if a healthcare provider has a CT scan or other imaging modality in their office, and they think it may be warranted, they'll say, okay, let's have this examination. We can do it right here and now. And there are some data that show when these healthcare providers who own or have ownership of this equipment use it, as you can see in this chart here [on the slide] that the ratio is much higher of the use of this examination when it's owned by that individual rather than an independent facility. So it's almost three times as high when the equipment is owned versus going to an independent facility. So that helps to drive use.

Moderator: Sure. I mean, that is not a negligible number!

Frush: Right. That's correct.

Moderator: What about other things that influence decisions made around CT scanning?

Frush: An element in healthcare, particularly in the United States, is what's called defensive medicine. This is basically trying to avoid having a situation where you might be sued for not detecting something, and so on. So the tendency in some situations and with some healthcare providers might be to say, well, I'll get this test done because I don't want to miss something.

Actually, you can look at a number of data sets on this. For example, the Journal of the American Medical Association did a survey and a very high percentage of physicians said they used imaging modalities and laboratory tests in situations where they may not have normally done so, and that also drives use. That is the defensive medicine issue here.

Moderator: Certainly, there's a number of different factors driving the use of CT scans and we talked a little bit about the high doses and the low doses.

Frush: Right.

Moderator: Let's turn a little bit now... can you talk about CT imaging in relation to children, and the volume of testing that's being done on children?

Frush: Right. And we do a fair amount of CT examinations in children as well: anywhere from about 5 to 10% of all CT examinations performed are in the pediatric population. It's interesting if you look at the numbers, too, that the majority of these are done of the head, often in the setting of injury, or maybe headaches would be another situation, and they tend to be done more in the older pediatric population, among teenagers. But we do see a little bit of rise in the very young children also – those who are most susceptible to radiation just because of congenital abnormalities, birth-related issues and so on, and those are the two [pediatric] populations that tend to get the most examinations.

Moderator: And when we're talking about pediatric CT scans, you mentioned the differences in dosage. Do the doses vary with pediatric scans as well?

Frush: Well, they can, and I think it's important for everyone to understand that the doses should vary a little bit for similar examinations. For example, looking for kidney stones might use a lower dose than a complicated examination, such as looking at the pancreas. There should be some variation. I think some data and scientific reports show that amount of variation is greater than what we would like to have in terms of the doses that children are exposed to for similar examinations.

Moderator: Sure. Now, you've already covered quite a bit of information this morning regarding a pretty wide variety of topics on radiation exposure. Can you give our audience a summary on the main points that you covered so far, before we move forward?

Frush: Before before talking about the perceptions and risks with this, it's worth summarizing a little bit that radiation doses for CT *can* be relatively high when compared with things like x-rays. Although, again, I want to emphasize that we're still talking about low levels of radiation exposure. We know we do a lot of CT examinations in the United States, and that includes the pediatric population, and we should as a healthcare team be more responsible for making sure those doses are just right and there's not a high degree of variation.

Moderator: So, now in the next focus of this show, we're going to talk a little bit about perceptions and risks. Tell me about the media and how media portrayal of CT scans might influence the public's perception. You talked about, you know, when we saw that picture of for

example of the appendix, clearly doing a CT scan is a valuable tool in doing diagnoses. But I think that sometimes the public's perceptions of risks versus benefits might be skewed a little bit. I wonder if you can talk about that.

Frush: That's an excellent question and the media is incredibly important in conveying information, and some of that information is based on fact and well-founded and discussed in a balanced way, but sometimes that information that is conveyed through the lay press and public media and so on it can be somewhat alarming. One article from "USA Today" that was published about 15 years ago in the front page of the paper said that about 1,500 children who had a single abdominal CT examination were going to die from cancer caused by that CT examination. That's wrong. That information is wrong, but it did serve to, I think, generate public concern and a more integrated effort by healthcare providers, industry regulators, et cetera, that we really need to pay attention to this issue. And even more recently, within the last year or so, articles continue to come out: the "New York Times" had a title "we are giving ourselves cancer," which certainly catches the public's eye, and we need to be accountable as healthcare providers as radiation specialists at providing balanced information through our press as well as through the general public media.

Moderator: Given some of the, perhaps, misrepresentations in public media, how has the public received or has the public received any of the message that's been presented by medical literature as opposed to general media?

Frush: I sort of alluded to that a little bit earlier. We need to do a better job in our scientific journals of doing this, and I will say that the opinions vary and the data vary out there. There are reports that say that CT examinations actually are beneficial, that low amounts of radiation are actually helpful. There are reports that say low amounts of radiation, such as with CT examination, can be harmful and then there are reports that we simply don't know, the risk is uncertain. It's important that we try to balance these things together with we communicate risk. That's a challenge we have as a healthcare community to do that, and its part of the reason we're having this discussion and the audience is joining us today.

Moderator: Yes, to try to clarify some of that. Can you give us an example of the studies that might have contributed to the public misunderstanding or confusion about the risks associated with these scans?

Frush: Sure. It was just a few years ago that three papers came out that connected CT examinations performed during childhood with a development of cancer. They obviously got a lot of attention and this issue came again to public awareness. There have been two subsequent papers - one from Germany and one from France, which questioned the epidemiology, the population studies of these other investigations, and when we control and look at several different parts of these studies, we can see that actually there isn't a risk. So the newer papers in 2015 - the two that I cited here, have not demonstrated that this risk exists and basically the conclusion then is that we still don't know if there's a risk and there is some uncertainty. But you can see here how different scientific papers can lead to different conclusions.

Moderator: Yeah, absolutely. I would believe that, you know, for a medical professional, it

would be hard enough for you to discern the information, and then for the public that doesn't specialize in this, when you're hearing conflicting sets of data, it can skew your understanding and muddy the waters a little bit.

Frush: Right, right.

Moderator: Why is there all this debate that's surrounding the risk of CT testing? Where does that come from?

Frush: Well, some of that debate goes back to the papers that I talked about, the three that connected CT examinations with subsequent development of cancer, and part of the issue there was interesting because some of the cancers that were documented were actually not cancers that are known to be caused by radiation. Some other issues were actually the CT examinations performed of a certain region of the body, the chest, abdomen or pelvis or associated with development of brain cancer and that just doesn't make sense because the amount of radiation is really limited to that area. There are other things that come up when we talk about radiation in children. We assume children are more sensitive to radiation overall, and that, to a large degree, is correct, but there are actually some cancers in which adults are more susceptible or adults are more sensitive to that radiation, and there's a number of cancers that we simply don't know about causality, so it's not that clear. A lot of the information that we've gotten over the years have come from atomic bomb data that is now 70 years old, and there were problems with that in terms of a single exposure and how much radiation did people get. It's a well-studied group but there are issues with that. So, many of these factors, again, I think, have led to the debate of whether there is or isn't a risk.

Moderator: So are there some things, given the debate that exists and some of the uncertainty and conflicting data, that we *do know* for certain regarding CT imaging and the risk in children?

Frush: Yes. Given these uncertainties, what we *do know* is that children are more sensitive to radiation, in general. And part of the issue is sometimes that low amounts of radiation that children are exposed to in causing cancer may take decades to happen. That risk may go on for years and years and years, and so children have a longer lifetime obviously than a 70-year-old that might be getting chest CT scan as well. Their life expectancy is less. Children have a longer life expectancy. What we assume with radiation exposure and chest x-rays and CT examinations is that risk is cumulative. So it doesn't go away over time. There are some people that debate that, but it just generally easier to make that assumption. Finally, it's really important to realize – and when we talk about techniques and tactics that we use to control radiation – that you understand that you can't use the same amount of radiation for a child who weighs ten pounds as an adult who weighs 200 pounds. You simply don't need that amount. It will result in a higher dose. Since they're more susceptible, that has a more profound impact on risk.

Moderator: Sure, that makes sense. Given this information, are there any other ways we, or medical professionals, can mitigate the risks for children due to CT imaging?

Frush: Right and many of these strategies are based the imaging community, say, with

radiologists. There is a need to work with referring providers and with healthcare providers who order examinations. If an ultrasound or MRI might answer the same question, those studies don't use the kind of radiation that we're talking about – ionizing radiation – so when you can use another modality, that's very helpful. When the child gets to the CT scanner to be sure that they're comfortable, we allow parents to be in the room, that there's adequate immobilization, that they don't move and affect the study, and that we use things like dye in the correct way and that we adjust what we do based on what we're looking for and what we're looking at like the chest because there's a lot of lungs and air there. We don't need the same dose of radiation in that area. So we will tend to use less radiation. We do a chest CT then when we do an abdomen and pelvis CT and adjust the parameters based on these things. Finally, for most of children's scanning, we don't need to do what we call 'double scans' or 'two phases' of scanning (that is, to do something before we give contrast and after we give contrast) that we don't need to do – delayed images. Almost everything we do can be answered with one scan through that area. Because again, if you do another series through that, it's going to be an additional radiation dose. Generally in pediatric body scanning, which we consider chest, abdomen and pelvis, it should be less than 5% of those scans that are more than one phase. Those are all things that we can do to help control the radiation exposure to children.

Moderator: Okay. So there's certainly a few different strategies that you discuss.

Frush: Absolutely.

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Moderator: Excellent. Now, we spoke with Dr. Robert Rappaport, with Albany Advanced Imaging, about how he talks with physicians and patients about tests and risks. Let's take a look.

Rappaport: My name is Robert Rappaport and I'm a radiologist with a specialty in neuro-radiology and I work at St. Peter's Hospital Medical Associates at Albany Advanced Imaging. Regarding children there are two major concerns I have. The first and most important is to make sure we minimize the amount of radiation kids receive and the reason for that is when kids are young and they have actively growing cells, they're much more susceptible to the harmful effects of radiation. The second thing is I want to make sure that the child is comfortable and feels safe and that way we are able to get a much better quality exam because they're much more cooperative. We frequently get questions from patients' physicians about whether a study is worth the radiation dose, and usually tell them a couple things. First, take a look at the place where you are going to take your test, the hospital or radiology office and make sure they have certain, good housekeeping criteria. Are they accredited by the American College of Radiology or other accrediting societies, and do they say they abide by the Image Gently campaign, the Image Wisely campaign, and you can be assured, when those things are present, you will get a much lower radiation dose and be assured you need the test.

Secondly, make sure there isn't a test being ordered for a 'CYA' or a legal reason. Do you really need it? I think if people ask themselves honestly, they can usually figure that out. When an order comes through and the test ordered is not the correct test to evaluate a specific order, the first thing we do is call the office of the ordering physician. We talk to them directly and explain

to them how the test that's been ordered may not answer their question but offer them alternatives of what is the correct test. Sometimes they ordered a CT but the correct test is an ultrasound or MRI. How can radiologists make sure patients get the appropriate exam and not be swayed by the exposure? That can be a challenge. That can be a risk, but I think patients and parents understand that everything in life has small risks and some benefit. Certainly you get in your car to drive to work, the benefit is you drive to work and you have a job. You understand that there's a small risk that you'll have an accident and could get hurt. I try to relate that there are small risks to radiation but if you need a test, the risks and radiation shouldn't dissuade you and if the test is questionable, you don't need it, don't get it.

Radiologists and clinical physicians both have busy schedules, but it's important for them to talk more to one another in order to benefit the patient. How can we do that? Radiologists need to be accessible to their referring clinicians. They need to be available on the phone and be available in person. Likewise, physicians, clinical physicians need to recognize that radiologists are there not just to read images, but we're there to serve as consultants as to what test to order. It needs to be a collaborative relationship between the clinical physician and the radiologist to make sure the patient is getting the right test and the best way to do that is an open, friendly dialogue.

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Moderator: Dr. Frush, can you tell us more about the program that Dr. Rappaport mentioned, because it sounds like a fantastic program?

Frush: Right. The information he provided is excellent. That was a great summary of some of the resources available and I think two major resources that the audience should know about are the Alliance for Radiation Safety and Pediatric Imaging, or the Image Gently Alliance - that's for radiation protection in children, and Image Wisely, which is the sister organization for radiation protection in adults. Let me talk about Image Gently a little bit, because that's what I deal with with children.

Image Wisely is basically is an organization that started in 2007 and was based on a strategy called social marketing to use internet-based or modern forms of communication to deliver a message to the public to change behavior. That change is not for the benefit of the producer of that information or the product but it's to benefit society. I think [social marketing about] mammography is an excellent example of how to get information out to women about screening and the benefits that's been a very successful strategy. It's an organization that is an advocacy organization focused on a positive message and how we can do things better? It's about education and it's about educating not only ourselves as radiologists, but the technologists and experts that we deal with in obtaining the images and those who work with us and our equipment and healthcare providers, too, those people like pediatricians and community physicians, family practitioners or surgeons who might refer patients. But it is also very valuable information to parents and the public and with websites for both of these organizations, Image Gently and Image Wisely. The website for Image Gently is www.imagegently.org.

Its about 'what is a positive message?' What is a helpful message for parents, patients, et cetera, in terms of the right test at the right time, using the right kinds of dose. There are nearly a hundred organizations globally now, and more than a third of these are internationally based. So this is a message that really has gone quite global and if you look at the constituencies of these various organizations, there's now more than a million healthcare providers that have subscribed to the philosophy of Image Gently. How have we gone about doing this as an organization? It's through things that I talked about with social media, but there are also conferences that are put on. There are articles written in professional journals and there are campaigns that are out there such as a CT campaign. Our most recent campaign was a dental campaign in the fall of 2014 where information on use of medical radiation in dentistry was provided through the experts in that organization. It's just been a very satisfying experience to be able to have this kind of content available to all stakeholders from the imaging experts and medical professionals all the way through to the patients and the individuals that care for them.

Moderator: So it really does sound like a very comprehensive way of reaching all of the folks who are involved in this process using a variety of different methods. That sounds fantastic. Can you talk about some of the challenges that exists when it comes to communicating the risks?

Frush: Right. So risk is a funny thing to talk about. And you know, there are many reasons for that. Uncertainty is very difficult to discuss. That's one of the challenges of that people have that and it's also the audience that you're speaking with, the patient or the patient's family and the pediatrics we deal with both of those and caregivers have different expectations about what they should know and what they want to know, different levels of understanding and so that leads to a little bit of complexity. Generally, when you talk about risk, low levels of risk are generally overvalued or overemphasized and an example a colleague of mine used one time was the lottery. Your chances of winning the lottery are very very low, but everybody buys that ticket thinking it's my turn now. Likewise, dealing with the low risk of, say, cancer, low potential risk of cancer might be overemphasized when that parent or that caregiver comes in and there's a conversation about this, and there's many ways to talk about risk to put it in frames and ways that people understand, the delivery ends up being very important but I believe in communicating that and it's a responsibility for the radiology community to do that and to try to keep it simple. Initially, deal with the very basic things and then if someone wants additional information, you can go on and say, 'this is what we understand about this,' but in simple and direct language. Being flexible in that conversation is very important.

Moderator: Now, are there any images or charts that you have found useful in communicating variation of risks in different situations?

Frush: There are a number of ways to do this and one illustration is to say how does this risk compare with other things that are eventually going to kill us at some point in time and we know that cardiovascular disease, whether it's heart attacks and strokes and cancer are things that are high on that list in terms of the end of life and if you look at then what is the amount of radiation from a CT examination and what sort of potential risk, and I have to emphasize potential because, again, this risk is not established but potential risk, you can see on this illustration here that it actually is very low. These kinds of illustrations are very, very helpful in

terms of framing that risk, in terms of other things that people understand, everyday things, other causes of injury and illness in pediatric populations and adult populations.

Moderator: Sure. Having that visual image helps to put it in perspective when you see it in comparison to cancer and heart disease.

Frush: Absolutely. That speaks a lot when you see it visually. Sometimes the words don't convey that. That is a very important way of communicating risk. That's the kind of content available on Image Gently and Image Wisely sites.

Moderator: I would imagine the way you communicate risks would vary depending on the physical environment or situation that you're in. Can you talk about how those factors might influence the conversation you have or the way that you communicate?

Frush: That is such an excellent point because what we dealt with in the previous parts of this conversation are basically facts, you know, how much do we image, what do we understand about risks and so on. So the content ends up being very important. As I said, those sites Image Gently and Image Wisely have excellent content, but as you know in your profession, the delivery and how you say it and when you say it ends up being incredibly important. You can say the same thing at one point in time and it's perceived entirely different. And when patients-- patients aren't seeing doctors usually because they're feeling great and everything is fine. Especially in the emergency setting, there's a sense of urgency, there's a sense of uncertainty and a sense of handing over the care of your child to somebody else and you have to make decisions for that child. They're not, you know, maybe they're two or three and they can't do it. So there's a heightened awareness and a heightened sense of alarm and so how you say things and what you present has to be taken in this context. You can't have the same conversation and the same content in every situation. It's really important to realize that.

Moderator: Would you say, too, when you are dealing with children, it's difficult for parents to make a decision or an informed decision when it comes to their own child for them to process the information that you're giving in a balanced way.

Frush: Yeah. It gets back to this issue of low probability or low risk things being exaggerated a little bit and I think it's easy for all of us who have children or grandchildren to put ourselves in that situation. When you hear there is a 1 in 2,000 or 1 in 3,000 risk that something might happen badly from the CT examination, we are going to get some very important information, but you have to understand that there may be something bad that happens and maybe this will be ten years down the road, 20 years down the road, but we're not really certain. All that parent remembers from that conversation is, well, that bad is going to happen to my kid and the rest won't happen. It's human nature to do that and we have to recognize that during the conversation. That's why I avoid having numbers affixed to what is the risk of the potential risk of CT examinations with children because, again, we simply don't know. Then to provide this number automatically elevates that conversation and I think puts an undue level of concern and alarm on somebody who is looking to you to be an expert and to convey information on the importance of the examination.

Moderator: So you clearly value and have taken time to think about how to communicate these things to your patients. When patients have questions about the risks, are there recommended approaches that you would suggest for communicating?

Frush: Sure. There are ways to do this right and ways to do it wrong. For example, a wrong way to have a conversation, and I would say that this conversation happens a fair amount - someone comes in needing a CT examination, a young child maybe hit their head, and the physician is worried about some significant injury in the brain, an area of bleeding that might need some further monitoring and perhaps an intervention. So a CT examination is ordered and the parent, knowing maybe what's in the lay press and the paper, says, 'well, hey I understand CT scans might-- I know they have radiation. They might cause cancer.' and the response by the healthcare provider is 'I don't really know,' and the next question is, 'Is my son going to get cancer from this examination?' 'Well, I don't really know.' The next is, 'Do you use appropriate techniques for children in your practice or do the radiologists?' Well, 'I don't really know.' Right now, you see-- these are understandable responses because there's again, a lot of misinformation. It doesn't inspire a lot great deal of confidence in that parent. They come and they want to know that you know this is a necessary exam, that what you're doing is going to take the interest of that child and needs of that child and you're going to use only appropriate amount of radiation. You are going to take the interest of that child to heart, and that you are going to do the best you can. They want you to hold their hand. Take you through pit make sure that you are doing things right.

The way that conversation, in my estimation should go is someone says 'Hey, I've heard that CT examinations can cause cancer.' I always start by saying, 'That's a great question, and I'm so happy that you're advocating for your child,' because right then, you establish that great, great physician-parent or caregiver relationship and it is a great question. I appreciate people asking that. Whether we know how much radiation we're giving through our CT scans here: 'We do everything we can to adjust the amount of radiation to the specific needs of your child.' I always say this is a really important examination. Let's consider we have to do it and that 'have to do it' ends up being very important because you're telling them you have made the decision that this needs to happen. And at the end of that, I ask whether they have any more questions or need to talk about things more. I think that inspires more confidence in the fact that you are really going to take care of that child as they go through the medical system and have that CT examination.

Moderator: Sure. So instead of focusing on what we don't know, we should be focusing on telling a parent their concern is valid and here is the information I have used to make this decision.

Frush: Absolutely. We cannot dismiss the parents' concern. They are real concerns, whether you believe they're well-founded or not. Whether you believe they're based on information that is faulty or not. A lot of what's on the web is not great information and it's much easier I think to find bad information than it is to find good information, but to establish that relationship immediately saying I am so glad you're asking this because that's really important to do, I am going to tell you everything we do to take care of your child, and I am going to tell you that this is a necessary examination and again, these are conversations that might be shared between the emergency medicine physician and the radiologist. Either can have this discussion, but that you

basically lead them on the path that says this has to be done and we are going to take care of your child as it's being done. I think it's very helpful.

Moderator: Great. Now in your experience as a radiologist and working with Image Gently, what can you say are the most important things that a provider should keep in mind as they approach their strategy for dealing with CT imaging?

Frush: I guess that's the sort of background for the conversation that we're having today and it's really important for everyone to remember the plus side of imaging, the benefits of CT examinations. A number of physicians were were polled and they were outside of radiology and they were asked what are the most important advances in health care? And CT was listed along with cardiovascular and others and CT examinations provide life-saving information every day across the country and it's very important that everyone understands it's very helpful. Most medical imaging that we do when it's appropriate will provide useful information, that is helpful for us.

It's also important, then, to be advocates for the patients and understand that they have the right to know to have this informed discussion and that we as the collective healthcare providers, whether we're radiologists or emergency physicians or pediatricians have the responsibility to provide information to them that lets them know why we're doing things to a level that they can understand and we provide resources and, say, the websites that we talked about, Image Gently and Image Wisely, if there's more information that they need and that we understand that this content is important and we tailor that conversation based on what the patient's level of understanding and reassure them that what we're doing is the right thing to do. Those are the tenets, I believe, of this conversation we're having here.

Moderator: Excellent. Now, can you recommend any other resources that you think would be useful for providers or for our audience on this issue?

Frush: in addition to the website that we talked about, there are other resources that are available and those resources are on a global level coming-- one of them is through World Health Organization. It's a tool kit on communication of risk and its benefit is that it is primarily directed toward healthcare providers, but there is some information for the public in there and this should be out this year. It is a great resource for individuals at a global level in terms of what we understand about risk and how to communicate this risk. It's also important to have age relevant means of communication and for camel, you can see in this cartoon here that there is a group that's developed CT information for children. So in this resource here the child can read this cartoon or comic strip and say, what's a CT examination involve, is it gonna hurt, how long is it going to take, what does it provide so that we have also age-based or age-relevant communication strategy. So those are a couple other situations in which it's helpful.

Moderator: Excellent. Now I think you've covered a lot of really good information today both from the early part of the show when we really talked about what the risks are and some of the past harmful effects we've seen with higher doses of radiation and then leading up to this really fruitful discussion about how do we communicate the reality of what goes on in a CT scan and what are the associated risks. So can you share with us the take-away messages that you hope

our viewers when they are wrapping up from this show, what are you hoping people walk away with?

Frush: Good. I'm happy to do that and I also welcome questions, too. We'll have the opportunity to discuss things that might not have been covered and again, I have to emphasize that CT examinations provide incredible useful information across a wide variety of illness and injury in children as well as adults. It's a wonderful modality for looking at so many different things. While this topic is of CT radiation, radiation risks and having an informed discussion, it really needs to be in the broader picture that CT is incredible useful. We know that it uses radiation. Okay, radiation is necessary for the formation of these pictures and we know that the type of radiation that's used at very high levels can cause cancer or has a risk of cancer. Although as I said, the CT examinations and many of the other x-ray type studies are very, very low on that curve or that graph of risks versus dose, that we know there's radiation use and we should try to minimize radiation dose whenever we can, only use the studies at the right time, we do the examination and use them in the correct way and that it's also in the public eye because we do CT examinations so frequently. So the relative dose can be high for CT and we do a fair amount in kids and we do a fair amount in the adult population as well.

It's understandable that there is public concern because it is a CT scan is a CAT Scan. Everybody has heard of a CAT. Scan. They may not know exactly what's involved. Everybody has had one or knows somebody who had one. It's a very frequent thing. It's important then to have this dialogue related to what the radiation dose, what are the potential risks, et cetera, and what we do understand about risk and my summary is we don't know at the levels of CT examination what that risk is. We simply don't know. There are no scientific reports that prove that there's a cancer risk from low level exposures. We still want to protect the patients we take care of and try to minimize the amount of radiation they have. We don't take this lightly and we want to protect ourselves which is why we wear lead aprons and so on when we're in areas of radiation exposure. I'm not minimizing the risk issue but I want to put it in the appropriate perspective, we want to make sure only the correct amount of radiation is used and we have many ways to do that as I alluded to with some of the new technology that's out making sure that CT examination is used and we're doing it correctly and adjusting it to children. And that we understand that people have a concern about this, and we need to respect that because of what we talked about in the press of articles out there saying this is really harmful and more of an alarming perspective of some of the uncertainty in our own literature. That we have responsibility for a mindful, informed discussion that reassures the patients, really, that's the emphasis here, that reassures them that we understand what the issues are, what we know and what we don't know and how we're going to take care of them and their children as they go through the healthcare system involved with medical imaging.

Moderator: That's a fantastic summary, and we do have some questions from our audience. So let's see. The first question, based on this information, what should patients ask when having diagnostic imaging?

Frush: Well, that's an excellent question and if we look at what kinds of things we talked about here, I think that asking questions should be encouraged and people should feel, parents should feel, no hesitation in doing that, to ask the healthcare provider first. Is the CT the right

examination? Do we need to do that? Can we wait? Is it important that we do it now? Is there something else, an ultrasound or MRI that might give us the same amount of information? Is that the first thing to say does the CT examination need to be done? If the CT examination does need to be done, I think it's reasonable to say the place that you're sending me to, do you understand that they use appropriate pediatric techniques? Are they expert in scanning children? Are they going to take my child's size, et cetera into consideration with they do this examination? That's something that can be asked at the point of care with the healthcare provider, but it's also something that parents and caregivers should feel free to ask once they get to the radiology practice - How are you going to do this examination? Do you have child-based techniques, et cetera or basically, are you going to take care to treat my child individually? Those are great questions for parents and other caregivers to ask.

Moderator: Thank you. The next question, talk about an example about when a conversation with a parent went poorly and what happened as a result, as well as one that went well and what you think made that go so well?

Frush: When it went poorly? I think I gave sort of a theoretical conversation in the emergency setting, it's when somebody asks a question and that information, say, you know, 'Does a CT scan cause cancer?, I know there's a risk of cancer,' when that healthcare provider doesn't know the answer to that. Again, it doesn't inspire a great deal of trust and confidence, and then there begins to be this friction about that. Is the test warranted, et cetera? And I think also one thing we didn't touch on, and it's important for everyone to realize, is that a normal CT scan is not a wasted examination because normal tells you so much about what might not be there and there's often a misunderstanding by the parent or the public that, 'hey, I got this CT examination on my head because of my bad headaches and it was normal so it was wasted' but all the things that aren't evident on that scan, you know, may tell us something that's significant. Is there a growth in there, a mass, a tumor? Are there any birth-related things that might cause a headache, et cetera? So a negative scan or a normal scan is actually very important information.

And what doesn't often happen in conversations, too, is when it is normal that healthcare providers say we got very important information in this. It was really important that we do this examination. You shouldn't order an exam if you-- if a normal or an abnormal isn't going to help you. Neither of those needs to be part of that justification process. Those are conversations that don't always happen. And conversations that go well, I think are due to just good fundamental human interactions to be compassionate to welcome questions, to take time. I know we're all busy. That's the problem. I think a lot of parents and individuals in healthcare say my doctor doesn't spend time with me. They don't talk with me. I don't understand. I ask a question and they're gone or whatever it is. It's important to take that time necessary to make sure they understand the question and this has such benefits down the line.

Moderator: And what would you say, as a follow-up, what would you say to the provider who says it's not my job to assuage these people's feelings to hold their hand. What's the buy-in to the medical community that they should have these encouraging dialogues that you're suggesting?

Frush: Again, it is somewhat of a shared responsibility, but I take what we do as radiologists, pediatric radiologists very seriously. It goes back to my comment that you don't see it, feel it, taste it or touch it. It's easy to look by that. I look at it as a medication, and if we're using too much or too little, that's the wrong thing to do. So, that's my responsibility and we need to provide the resources to the front line, to the point of clinical care, to those individuals. I don't expect a pediatrician or emergency physician to have the same kinds of detailed conversations that I might have, but that's exactly why Image Gently and Image Wisely were created. These are resources for healthcare providers to go to, there are parent sheets that can be downloaded. There are sheets for healthcare providers that provide summary information for this, and even financial information.

Even if it's just knowing those websites exist and saying to the parent, those are great questions. I trust the radiology group that we have dealt with for years, they're great individuals and they're doing a great job. You're asking great questions that are a little bit beyond my scope of responsibility and scope of practice here but I do know of a great resource for you to go to, imagegently.org and the website is very navigatable and that is a way that the parents can find this information or the healthcare professionals can have these sheets available in the office and it's the same thing for the Image Wisely, the adult counterpart. We are, through Image Gently, trying to provide information to healthcare providers to have this discussion. It's important that we take responsibility for this, too. As radiologists, we don't say we don't deal with patients and read their examinations and any questions need to go back to their healthcare providers. We have to be accountable for this. It goes back to the "USA Today" article back in 2001, where they said that all these children are getting cancer. That's because we weren't taking the responsibility to do things the best for ourselves and to educate the patients and the public and we're much better now. We still have a ways to go.

Moderator: Always room for improvement.

Frush: Absolutely.

Moderator: Those resources are a great tool for medical providers to have those conversations and make sure that the information is getting out there.

Frush: That's a perfect summary, yes.

Moderator: We have another question - is scatter from CT scanning a concern?

Frush: Most call medical imaging that uses x-ray from an external source like x-ray tube for regular x-rays or for CT examination very well controlled. It's very tightly limited to that area. The manufacturers have done an outstanding job of helping us with this. We still want to minimize the amount of radiation and the scatter exposure to ourselves and if a parent is in the room during a CT examination, we have them wear a lead apron and sometimes we'll put lead aprons on children for parts that aren't, say, over their lap if we're doing an x-ray of their wrist, et cetera, to try to minimize any potential spread of radiation, even though that spread is really minimal and many of those protective mechanisms are unnecessary with the minimal risk. It's very minimal, but we still feel it's important to do this and convey the sense that we're trying to

protect ourselves and our patients as much as possible. So most of the scatter is what we call internal. So it's the x-ray particles that bounce off things and bounce around and as you know then, putting a lead apron or a lead shield on the outside doesn't do anything for that. Most of the external scatter in most modalities is very limited. If people use lead aprons during CT examination, that's fine. If there's a situation where they don't use it, that is also defensible, too. So people need to understand both of those.

Moderator: So the follow-up question is then, should lead aprons be used in pediatric head and neck CT scanning.

Frush: I will leave that decision up to the individual practice. I think it's probably a good idea if it doesn't affect the image quality, if it is not going to make the child move, et cetera, to consider using these types of external shielding and certainly to ask and again, that can be a conversation that happens between the parent and so on, and say, 'hey, we can put lead on in this area here. What we know is there is a very limited amount of radiation, but we're very happy to do it and we generally do it. If you would like us not to do it, that's fine.' And be able to have that conversation. The bottom line is those types of protective things are addressing a very small amount of radiation but they can be very important in conveying a sense of trust and a sense of expertise to the parent and the caregiver.

Moderator: Great. Well, thank you so much for everything you have shared with us today. Unfortunately, we're out of time.

Frush: You're welcome.