

EPISODE 13: TAKING YOUR MEDICATION

Rita Kalyani, MD: Welcome to *Diabetes Deconstructed*, a podcast for people interested in learning more about diabetes. I'm your host, Dr. Rita Kalyani at Johns Hopkins. We develop this podcast as a companion to our *Patient Guide to Diabetes* website. If you want a trusted and easy to understand resource for diabetes, or to listen to previous podcasts, please visit hopkinsdiabetesinfo.org.

Today we are pleased to welcome Alona Crowder. Alona graduated from Xavier University of Louisiana College of Pharmacy and completed two years of residency training at Parkland Health and Hospital System in Dallas, Texas. She is also board certified as a pharmacotherapy specialist and is a certified diabetes educator. She currently practices at Johns Hopkins Community Physicians Odenton Columbia Medical Practice. Her professional interests are diabetes management, cardiovascular diseases, and low socio-economic and underserved populations. Welcome, Alona, to our podcast today.

Alona Crowder, PharmD, CDE: Thank you for having me.

RK: We are very excited to have you here and hear a little bit more about practical strategies that patients can take to take their medications at home. And so, I wonder if you could start off by talking a little bit about why it's important to take your medications as prescribed and what to do if you miss a dose.

AC: So we know that diabetes management can be a challenge. There are lots of things that we have to consider anything from eating to the activity level, but also working very closely with your providers/your healthcare team to make sure that you're having the right medicine in the right time. Because if we don't have the right medication or the right strategy for you, it could be a little bit more challenging to meet your overall goals. So think about medication management. And it starts from the beginning with having an open discussion with the healthcare team about any concerns or questions when deciding a treatment regimen for that. [If] it's a medicine that might require multiple doses in a day, trying to figure out the best way to put that into your schedule. If the unlikely event happens that you do miss the dose, what should happen at that point? That might vary based upon which medication that is being given. For instance, if it's an insulin dose, that's to be administered at the start of the meal, and you forget until that next meal that you missed that dose, at that point, we just don't want to take a double dose, but just being aware that this might affect the numbers at the time. But if it's a different medication, like a metformin or a pill that you're giving yourself once a day, and you recognize a couple of hours later, this would be an opportunity to go ahead and take that dose... If it is something that has already been discussed with the team. So whenever you are being prescribed a new medicine, what should happen at that time if you miss a dose is definitely a question that should be asked since it varies based upon that specific medication there.

A general rule of thumb for non-insulin medications... things that don't tend to cause low blood sugars like insulin or certain sulfonylureas – things like glipizide, or glimepiride – if it's not those medicines that cause low blood sugars, if you remember, within an hour or two, it's likely okay to take that dose. But if it's been several hours, [it's] better to just go ahead and skip that dose

and make a note of it in case you see a change in your blood sugars, and then just discuss it with your healthcare team. If there's ever a question at all, know that it's important to reach out to your local pharmacist or your healthcare team to ask that question to be sure because it might vary based on the person, the time, and the medicine that you're taking.

RK: That's so helpful because there's always things that come up unexpectedly during the day that might make you forget to take it at the usual time that you take a medicine or you're just on the go and may not be able to remember. And it's helpful to know that especially for those pills that you mentioned, where they don't lower the blood glucose too much or have that side effect of what we call hypoglycemia, that perhaps within a few hours, you could take the medicine if you talk about it with your health care provider first. Would there ever be a time that a patient could double dose like let's say they miss a day and take it twice the other day? Or in general [do] you just skip that day if you forget to take up?

AC: At general, it's safest to skip that day. Because we could always discuss if we need to increase or adjust the dose in the future after you've spoken to your healthcare team. But after giving that dose and giving a double dose, you don't necessarily know what the impact of that will be in causing things like not only hypoglycemia, or low blood sugar, but also more severe side effects: if you notice a little more nausea or dizziness. So definitely stick with the dose that's given. If we missed, I'd the safest is to hold off until you have some guidance from a healthcare team member.

RK: Yeah, that's definitely the safest, I would say, as well. Just checking and making sure. What about for long-acting insulin, the basal insulins – the ones that you take once a day. You know, I often have patients work... or perhaps not often, but I occasionally have patients who say that, "I missed my long-acting insulin dose at bedtime." Maybe they were up later than usual, or they were doing something different. What do you say about missing that dose? Is that something that should be made up at a reduced dose the next day, or also just skipping it altogether?

AC: So with a long-acting insulin, the rule of thumb that we tend to find is if you're giving the dose once a day, you should take that within half of that period. So within that 12 hour timeframe, so if you usually take it at night, and then you wake up in the middle of the night at 3am, it's okay to go ahead and take it since it's only within a few hours from there. We wouldn't want to get to the next day's dose, and it's been almost a full 24 hours in double that dose, because the impact of that could be pretty severe, where you'll have lower blood glucose readings. The thing now that there's lots of flexibility when you consider long-acting insulin. Some long-acting insulins are even still given twice a day. If it's one of those that period of time where you're considered, it's almost half the time until the next dose is shortened. And then you have other long-acting insulins that even allow a little bit more flexibility, where you can give that dose anywhere from 6 to 36 hours within that timeframe. The key is to know that for your specific medication, what would be the rules behind that. If it is a shorter-acting insulin that you're already giving twice a day, if you remember, by the time that next dose definitely wouldn't double the dose on it. If the plan is to adjust the dose down, then it likely should include a discussion with a health care team member – or an even hypothetical situation, when you're starting a new medicine to have that specific plan.

The things that can happen when making huge adjustments, like doubling a dose or cutting a dose in half, could have impact on glucose levels where you see ups and downs, and [you] definitely want to at least have that discussion with the team members about where to go from there. Our goal was to have nice steady glucose readings within our goal range for moving forward. And so if it becomes something that's a regular occurrence where if finding maybe shift work, and so one day you're working nine to five, and the next day, you're working overnight, and it becomes a little bit more of a challenge to take the dose at the same time. That is definitely a discussion about, "Okay, is there another option that's covered for me that allows that flexibility? Or, what's it a good time that I could consider to be consistent with the insulin dosing." And with long-acting insulin, our goal is to have a nice and stable glucose readings. And so if we're having a lot of those times where maybe [you're] missing a dose, then we want to reassess... is this the right medication strategy? And that's where that the team of healthcare workers – from your pharmacist, to your health care educators, to your provider, to your prescriber – finding the right thing that works best for you.

RK: And this is why, as you said, timing and consistency is so important to ensure that there aren't those ups and downs, in the blood glucose that you're talking about from taking too little or too much of the medicine. We talked quite a bit about insulin, but for medication that is taken by mouth, pills, one of the questions I often get is, "Do I need to take these medications with food? Or, do I take it on an empty stomach?" I wonder if you could talk a little bit about the common medications we use for diabetes in pill form and whether they need to be taken with meals or not.

AC: We're at a time with diabetes management that we have lots of tools in our tool belt in order to keep glucose readings under control. What I mean by that [is] there are several cool options – injectable options – and the way to take them might vary from medication to medication. Some common ones that we recommend taking with food are things like metformin; or sulfonylureas, things like glipizide or glyburide. [For] metformin, we recommend taking with food because taking on an empty stomach can cause some upset stomach or diarrhea. So, it's very important to minimize taking that on an empty stomach in order to avoid that side effect. Other medications – and like I mentioned a glipizide or glimepiride – the way that it works is it helps your body to produce additional insulin and insulin can then lead to potential low blood sugars. So, taking those medicines with food helps to avoid that side effect of low blood sugar. Then, there are other medications: things such as Januvia or sitagliptin, that don't necessarily cause the side effects that we mentioned with metformin or with glipizide/glyburide. And the most important thing is to take it at the same time each day. So if you're varying the mealtimes, you may not necessarily take it at the exact same time if you're targeting to take it with food. But with those medications, to get that full 24-hour coverage, you may decide that, "Okay, at 9am, I'm going to be able to take that medicine each day, even if it is not at the timing of the food."

To summarize all that, it's really going to be based on the specific medication if food is required. Something that is helpful is when you go to the pharmacy and you fill your new prescription; oftentimes, there are some labels on the side of the bottle that will say, "Take with food." And that's going to be very important to follow those instructions if it says that. If it's a

medicine that allows a little bit more flexibility, you won't see that warning of to being strictly taken with food.

RK: That's such helpful information to now. How about for GLP-1 receptor agonists that are taken once a week for instance? How closely do they have to be taken exactly on the same day, same time each week... or what's the flexibility there?

AC: Similar to our discussion with insulin and other oral medicines, we want to try our best to set a good schedule of taking the GLP-1 agonist on the same day each week. However, there's a little bit of flexibility with that. Let's say if you were aiming for Sundays to have your injection and before you know it, Monday rolls around, because it's so infrequent that you realize that you forgot to take it. But it's actually okay to take that medicine at that time but if it's been over three days' time, then we don't want to have two doses too close together. So, you at that point, you would want to either shift the future days, or it would be missing that dose to get restarted on to your schedule again. There is a little bit of flexibility with that. It doesn't necessarily have to be at the same time, but ideally the same day, and just having a plan in case you are without medication on that day and how to adjust and get back on track.

RK: Another question that often comes up is how should I store my medicine? And I wonder if we could start with the oral medicines first? Do they need to be refrigerated? Can they be at room temperature? What about when traveling? What do you recommend?

AC: With oral medications, it's very important to make sure that it's in a clean, dry location that doesn't get a lot of moisture – not keeping it in the refrigerator, not keeping it and on the bathroom counter that has a lot of moisture from the shower, keeping it out of reach of younger children or pets to avoid any accidental ingestion. Most tablets do not require refrigeration but should be at a place where you would feel comfortable. So that means room temperature: not a lot of heat and humidity, or not a really cold atmosphere in order to protect the integrity of that medication that you're taking. If you're traveling, I recommend keeping your medications on your person versus putting them in your checked baggage. It doesn't have the same climate control as if you're flying in the cabin there. Very similar with other medications... so your injectables and insulins. It is also important to be aware of the temperature and the climate that the injectables and insulin would be kept in. Slightly different when we're considering insulin or other injectables, you do have to consider the temperature with those, as well. Insulins and injectables when they come in a package of multiple doses, you often would want to store the unused doses in the refrigerator. When you're ready to actually start using the device, whether it's a vial and syringe or if it's an insulin pen, it can be kept at room temperature for around a month. That does vary slightly from brand to brand, but roughly one month keeping that at room temperature. Sometimes that actually allows for a more comfortable absorption whenever you're giving yourself the injection, but it also allows for ease in traveling with that, as well... whereas it allows for some excursions where it doesn't have to be refrigerated the entire time as long as it's kept in that room temperature for it.

RK: That sounds like there's slight differences by medication in terms of how long they can be kept unopened at room temperature. And so is that information usually available in the package insert, or where would a patient find that information?

AC: When you pick up your medication from the pharmacy, that leaflet that comes along with it – and includes a lot of really good information about your medication – it does include information about how long that can be stored at room temperature, or what to do if your medication is in other temperatures. Where it's definitely a good idea to take a look at that information that comes from the pharmacy each time, especially when starting a new medication.

RK: And especially for those pen devices like you mentioned, or the vials and syringes, where it can depend on if it's unopened keeping it in the fridge. But if it's opened, you know how long you can keep it at room temperature. So don't toss out those inserts. They're very important.

AC: Exactly.

RK: You know, we've talked a little bit about pens versus vials and syringes, but perhaps you could describe them in a bit more detail for our listeners who may not be familiar with what these devices are.

AC: When we consider different options for insulin, specifically things like a vial and syringe or an insulin pen, they're both options for having the same medication but just different delivery devices. Some patients may find one option to be a better and more convenient option for them, while others may prefer another option for various reasons – whether a cost difference or just a way to store it. The vial and syringe requires a patient to draw out a specific dose prior to administering it, using a separate syringe device that has markings to be able to determine exactly what the dose would be. If a patient is using vial and syringe, it's important to have pretty good dexterity and being able to visualize smaller markings that can happen on the vial syringe; as opposed to a prefilled insulin pen, where the pen includes the same medication the same insulin but prior to each use, a pen needle is attached to the device. And the patient doesn't have to draw out the dose but just what we call “dials up a dose” in order to get the accurate amount of insulin that needs to be administered there. So, that might be something that's helpful for a patient that has that difficulty visualizing and seeing those tiny markings on an insulin pen. They can use the dialing device that has a larger viewing area to be able to confirm that you're getting the accurate dose. If one device presents a challenge, then it's important to speak to your healthcare team to see are there other options that are out there that will allow an easier delivery of the insulin and to be sure that there aren't any missed doses.

RK: And it's great to have those options. And since it is such a personal choice whether to do the vial and syringe versus the prefilled pen, most insulin products would you say are offered in both forms? Although, many of the newer ones I think are only offered in pen devices, is that right?

AC: Correct. Yes, most you will have the option for both and we're seeing really a greater shift of more and more folks using the pen devices for the convenience that I mentioned that you don't necessarily have to draw out the dose. And if you're going out to a restaurant and knowing that needing to administer a dose prior to eating, it might be slightly easier to attach a needle to that prefilled pen versus drawing out a dose for it. But there are some options where you're correct, only the pen is available for that device.

RK: And for the GLP-1 receptor agonists such as liraglutide or dulaglutide, or semaglutide, those are all pen devices, is that right?

AC: They are, and in most cases, they are specialized delivery devices for each different agent. The look may be different than an insulin pen, or it may be very similar. So each device will be slightly different. And it's important if you're starting one of these new medications to be sure that you receive some coaching about how to administer that device. Some are spring loaded and there's a needle that you see. Although there's a needle there, it's just you're not attaching a separate needle while doing it. When you're picking up a new prescription – or whenever at the point of prescribing – whenever you're getting a new medication for one of these GLP-1 agonists, be sure that there's a discussion of: what the device looks like, where should it be administered, and what does it look like when you're picking it up from the pharmacy? Some of these GLP-1s have multiple doses in one device and others are single-use. So, being aware that for your specific device, which option do you have? Will you be discarding after you giving a dose or is there multiple uses within that one device?

RK: Great to hear about that distinction and those important questions to ask when you're getting your new medicine – in particular for an injectable medicine, a device, as well. You talked a little bit about where to inject the medicine. And I wonder if you could elaborate on that? Where is it safe to inject either insulin or a GLP-1 receptor agonist in the body? What sites do usually recommend?

AC: For most of our devices, we're trying to reach what we call the subcutaneous layer, so just underneath the skin. There are certain places on the body that makes it easier to ensure that you're getting into that that perfect layer; not getting into the muscle or just being sure that you're getting to the right location. Most patients will opt to using the belly as a place to inject as long as you're two inches away from the belly button and rotating injection sites, that is often a go-to location. Other places are things like the backs of the arms or the outer areas of the thigh. Again, being sure that you're avoiding areas that have muscle there. Oftentimes to know that you're getting to a good place, you're able to pinch that layer and you know that you're getting underneath the skin and not into the muscle area. Rotating injection sites are going to always be very important to ensure that you're getting – especially with insulin – a smooth absorption. It can be tempting to find one location that you really like and to stick with that exact location each time. In the cases of things like insulin, if you're giving larger doses over time, you could develop almost a little lump underneath the skin that will affect the absorption of that specific medication. So [you] may find that over time, despite increasing doses, the glucose readings continue to remain elevated. And so rotating injection sites ensures that you're able to get a pretty smooth absorption and good impact on glucose levels.

RK: And how often do you usually recommend patients rotate their injection sites? And how far away from the previous one?

AC: Each injection should be at different location. If you're an a twice-a-day insulin dose – and so if you're giving a dose in the morning, in the evening – [in] the morning [one day one], we do on the bottom left side of the belly and the evening on day one, you do the right bottom side and day two, the top left side. So just being sure that you're ideally two inches away from the

previous injection at a minimum, and then you rotating from there in order to have that kind of smooth absorption.

RK: And in terms of reducing the potential discomfort from injections although many of these new devices that you say have spring loaded needles or they may not even need the needle to be attached, they might be inside. But for those where you actually have to add the needle yourself, how can the discomfort be minimized and what kind of needles are available to help with that?

AC: There are a few things to consider. We talked earlier about bringing the medication to room temperature before administering. That certainly helps. Now there are so many different needle sizes that are found to be helpful. So asking for a smaller needle can certainly assist with that. If there's a bit of needle phobia or fear of needles, there are even specific pen needles that can be attached where you don't see the needle at all. That certainly kind of helps with that initial fear of [needles] that has to be overcome for it. So yes, keeping it at room temperature. Some patients may even find if you're using alcohol to clean the area before injecting, be sure that the alcohol is completely absorbed before administering just to avoid any kind of burning sensation that happens from there. In some cases, some patients have found that taking an ice cube and rubbing the area to kind of almost numb that area prior to administering... just being sure that the area stays clean and dry right before you're able to administer. Those are a couple of options that are there. The other very important tip is if you're using pen needles or you're using syringes, get a new needle every single time because each time that you inject, that makes the needle just a tad bit duller than the previous injection and that tends to lead to a bit more pain. So, new needles and using the clean, dry injection site and being sure that the medication is brought to room temperature before administering are just a few tips that can help with that.

RK: Those are such helpful tips to know. Thanks for sharing those. In terms of the needle sizes, there's often different numbers that are listed for the different kinds of needles. The higher the number, is that usually a thinner needle? Or is there a rule of thumb that you usually recommend to patients?

AC: So there are a couple of different things to consider. When you think about the length of a needle that is going to be the smaller the number the smaller the needle for the length. For instance, if we are using a half inch needle versus a 5/16 inch, so that's slightly smaller in length than the half inch. But there's another number to consider: that's going to be the diameter of the needle itself. That one is the opposite. So, that's going to be the gauge of the needle. And so that's an inverse number. The smaller the gauge, the larger the needle. The larger the gauge, the smaller and potentially more comfortable that needle will be. In most cases, providers will default to a shorter, smaller needle. So, you'll see a shorter length and a larger gauge needle to have that comfort level. And if in doubt, and if there's ever any questions, [at] pick-up, or when speaking with your team, ask, "Is this the best needle that's for me?" In most cases, any of those needles designed for getting in the subcutaneous space or underneath the skin will work for most patients. So, there's not really a reason to use a larger needle except in very small cases where when we want to be sure that we're getting into the correct space.

RK: So in general, it sounds like the smaller the length and the bigger the gauge, the potentially more comfortable the needle.

AC: Exactly.

RK: Could you give an example of a dimension of a needle that a person might want to look at if they're looking to reduce their discomfort?

AC: Usually around 23 to 26 gauge is what [is] considered for most. Those are really smaller needles there that tend to be helpful for patients

RK: And then in terms of disposal of the syringes, the pens, and the needles, what does a patient need at home, and what's the best way to dispose those?

AC: If possible, you want to definitely dispose of it in a hard container, plastic or a hard... what we call a sharps bin in order to avoid any sorts of injury to other folks that may come in contact with the needle itself. So if you have access to a sharps container, obviously, that would be a great way to go. But if you don't some other tips to choose... some sort of hard plastic that you may have at your home like an old laundry detergent container or an older milk jug or something along those lines where you can put the needle in and dispose of it from there. Now how to dispose of the needle will vary from state to state. Some states require certain rules to follow and you can't just dispose of it in the regular trash, whereas others as long as you're keeping it in a safe container, then you would be able to discard it with your normal trash there. So it's important to know the rules in the state that you live in, or if you're going to be traveling, being aware of the local requirements.

RK: So it sounds like it's safest to check with your health care provider or the state regulations in terms of how best to dispose those needles. One of the last questions I think that I often get is how to treat a low blood glucose level. For some medications... this unfortunately can happen like you mentioned when you're on insulin or those medications called sulfonylureas, like glipizide or glyburide. And when that does occur, how do you usually recommend that patients treat their low glucose levels?

AC: If you think that you may be having a low blood sugar some examples of things that you may be feeling at the time are things like feeling shaky, dizzy, your heart's racing or a sudden, intense feeling of hunger or sweating. Those are some signals that you may be having a low blood sugar. If possible, the first thing I recommend is to check and confirm that it's truly a low blood sugar that you're having. In many cases, those that target and if you're checking your glucose, if it's below 70, that's a red flag that this is truly a low glucose event that you're having. It's good to have sources of quick sugar to bring those glucose values up. So, things like hard candies like a peppermint or something that's hard that has access to that sugar there. Or if you have regular soda or regular juice available, having about a half a cup of that to help to bring the glucose readings up. I say regular because you don't want to use diet drinks at this time because it... it won't help to bring the glucose readings up. At this point is really important to have access to that quick-acting sugar. Another handy tip are to keep glucose tablets if you want

to keep those in your car or in your purse or next to your bed stand at night in order to [have access to them] if you have those symptoms to react to it.

Having that quick-acting sugar, about 15 grams of carbohydrates is what we aim for to bring up the glucose level, then waiting about 15 minutes and rechecking your glucose levels. Even if you're starting to feel better just to be sure that the readings are back to another safe level with a glucose around 90 or above. And then if let's say you've waited 15 minutes after you've given yourself that sugar, if the levels are still low, go ahead and repeat another 15 grams of carbohydrates. You can repeat the same thing that you had before – those hard candies or a little bit of juice, about a half a cup of that – and then wait another 15 minutes and recheck. At this point, we're hopeful that your glucose levels go back to the goal range and some of the symptoms subsided from there. And then at that point, it's really important to, one, recognize what caused that low glucose reading... Was it that [you] accidentally gave a double dose of insulin like we've mentioned earlier in the beginning? Or was it that [you] gave a little extra insulin? Were you more active that day? Didn't take the medicine without food? All those things can be signs of having a low blood sugar, and we want to pinpoint what might have caused that. And then at that point, definitely having a discussion with your healthcare team about what happened – if can identify anything that's causing those low glucose events – to have a little help to figure out what's going on there. At that point, you would be able to continue with your normal meal or your normal day; but definitely trying to treat at that time, recheck to make sure you're at a safe level and try to identify what's causing that low glucose symptom. Because even with taking medicines that cause low glucose events, it's important to minimize that from happening. If you are taking a medicine that regularly causes you to have low glucose events, or that you find that you have to have extra snacks or anything like that to prevent those low glucose events from happening, it's really important to have that discussion with the team to find out if you're still on the right dose, if you're still on the right medication, if there's anything that we can do from the timing of what you're eating to minimize those side effects from happening there. But the key is to have that discussion with the team so that we together can work to find out a solution that doesn't involve having the side effects that that you might experience.

RK: And who would you prescribe a glucagon emergency kit to?

AC: Everything that we talked about so far is how to self-treat a low blood sugar. Those tend to happen whenever it's a mild low glucose, or low sugar, that happens... you're still able to talk and identify the symptoms that are happening. But in some cases of a very severe low sugar – hypoglycemic event – requires further treatment from there. And glucagon is an option to quickly raised glucose when you can't treat the glucose – the low sugar event – on your own. And what that means is if a patient is unconscious, not responding, a family member would be the person who would be administering a glucagon injection. It's really important for patients – especially those who have been prone to have frequent low blood sugar events – if they're taking insulin and not aware of having the symptoms into the point where those low glucose events require a higher level of treatment, things like calling 911 are being unconscious and not being able to treat themselves... having a family member aware of how to use glucagon and the different delivery devices that we now have available for [them] to quickly increase glucose levels for in those specific instances.

RK: And especially for people taking insulin, talking to your provider about whether a glucagon emergency kit might be a good idea.

Well, Alona, thanks so much for being here today. We've learned so much about practical tips on how to take medications at home and make it easier to remember taking your medications and to take them safely, really, which is the most important thing. So thank you so much for being here today.

AC: Thank you for having me.

RK: I'm Dr. Rita Kalyani, and you've been listening to *Diabetes Deconstructed*, a companion podcast to the *Johns Hopkins Patient Guide to Diabetes* website which has all kinds of useful information about diabetes, including videos and animations, a lifestyle and nutrition blog, and a comprehensive diabetes glossary, among other topics. For more information, visit hopkinsdiabetesinfo.org.

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