

The Young Children Diabetes Program: Guidelines, QI, Insights, and Clinical Pearls for T1D ages 6 mo – 6 years at Texas Children's Hospital - Pediatric Grand Rounds-20261002_073004-Meeting Recording

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56m 15s

● **Calderon, Delia** started transcription



Calderon, Delia 0:06

We are good to go.



Sutter, Deena E 0:09

Okay, good morning, everybody, and welcome to our October 2nd Grand Rounds. I just wanted to let everybody know that Dr. Rodriguez is going to introduce our speakers, but before that, reminder to make sure that you turn off your mics, mute your device, and we will have time for questions at the end, which can be included in the chat.

And then in the chat, we also have our CME code. So please make use of that when you, when the talk is over with. I'll hand it over to Dr. Rodriguez now.



Rodriguez, Luisa 0:43

Good morning, everybody, and happy Friday. And I'm happy to introduce today our speakers, Dr. Kelly Ann Hicks. She is an associate professor at Baylor College of Medicine. She did her residency and fellowship at Baylor, and I had the pleasure to meet her ASAT fellow, work together.



Hicks, Kelly 0:46

Yeah.



Rodriguez, Luisa 1:03

and then having her as a faculty during my tenure at Baylor College of Medicine. Since her early career years, she has dedicated her research and quality improvement efforts to study and improve the care of young children with

type 1 diabetes. She is a co-leader, and I will call her founder of the Young Diabetes Care Clinic. And he's a clinic that they dedicate monthly to this special population. And I have shared with Dr. Higgs our pregnancy, raising toddler experiences. So it is, I'm very proud of introducing her and welcoming her to our Grand Rounds. With her, we'll be presenting her nurse practitioner, Sarah Kelly. She is also a faculty at Baylor College of Medicine for the

 **Hicks, Kelly** 1:46
I think.

 **Rodriguez, Luisa** 2:05
past five years. And she not only dedicates her work to the care of children with type 1 diabetes, but she also lives with type 1 diabetes. And it's my pleasure to introduce them to today's topic. They will be talking about young children with diabetes, a program, and they're going to share their guidelines, QI, insights, and clinical pearls for these challenging population ages six months to six years. Welcome to our Grand Rounds.

 **Hicks, Kelly** 2:45
All right, well, thank you all for having us. Sarah, if you want to go ahead and advance the slide.

 **Kelly, Sarah Renee** 2:55
Did it work?

 **Hicks, Kelly** 2:55
So we're just, oh yes, yes. So we're going to start out today. Our objectives are, we're going to talk about the structure as well as the components of the Texas Children's Hospital Young Children's Diabetes Program. From this program emerged several quality improvement projects in an effort to try to improve glycemic control in this patient population. So we're going to talk about how we

 **Kelly, Sarah Renee** 2:57
Seay.

came up with these projects, how we established them, and how we changed outcomes. And then finally, we'll discuss towards the end future quality improvement projects that we are currently working on to help provide better equity across all the patients in this population.

So the care of the young children is different than the care of the older adolescents with type 1 diabetes. They are smaller. They are growing at a more rapid pace. They don't always eat when you want them to eat. And so that becomes a bit more challenging to dose insulin for them. They also tend to have spontaneous activity. Unlike a teenager who is in team sports, who can tell you exactly when their practices are and when their games are.

and how they check blood sugars before and after and change carbohydrate content of fluids and snacks. But little kids can't do that for you. They play on the playgrounds, they go to PE, sometimes they play outside, they ride their bikes, they go to gymnastics, they go to little league soccer and so forth. And so it's a little bit more challenging to try to help the families predict what will happen at any given moment.

They also tend to get sick more. They are dependent upon parents and school nurses, teachers, and other family members for all aspects of diabetes care. If they feel low, they may not be able to fully tell you how they feel. So this now sets the stage for an extremely challenging patient population in diabetes care.

What we wanted to set out to do was to better optimize glycemic control while minimizing hypoglycemia risk. We realized that under our watch, we would begin to see the emergence of complications related to diabetes while these patients were still under pediatric care.

Imagine if you were a one or two year old who develops type 1 diabetes and your duration of diabetes is at least 10 years by the time you hit middle school, we will be facing the evolution of diabetic nephropathy under our watch in pediatric care. And having seen this and just the tragedy of it, one of my main goals was to try to minimize the future complications

but also addressing the acute complications too, DKA risk and hypoglycemia risk, et cetera. So what is optimal glycemic control in this population? In 2020 to 2021, the rules changed. So the American Diabetes Association and their standards, which they set forth every year, really began to recommend lower A1C values for pediatric

patients. And so for all pediatric patients, A1C of less than 7%. So not the old standby of just trying to get an A1C in the quote sevens, but really getting it less than 7% may be appropriate for most children. And so now for the youngest kids who cannot voice how they feel if their blood sugars are lower, how do we get the A1C to this threshold without causing too much low blood sugars?

Next slide.

So our burning platform was that when we looked at our data, we realized that young children with type 1 diabetes were not anywhere near meeting these newer glycemic goals that were set out by the American Diabetes Association. This graphic that you're seeing on the right side of your screen, the red bar are children within the same age group who have A1Cs above 7.5%.

The line or the bar in the middle is the United States. So the Type 1 Diabetes Exchange, this is US or American data. And you can see we're not doing so great when we compare ourselves to our European colleagues on the left. So the bar on the left is Europe, and that's Germany, Austria, Switzerland.

are the bulk of that database. And the bar on the right is Australia. And so we actually did, in forming our group, talk to some of our Australian colleagues and kind of how they had approached the care of the young children. But then this graphic is telling you that the US overall tends to have higher A1Cs.

And I can't tell you exactly why that is. I could guess, I could, I could think maybe it's nutritional, but we tend to overall not meet glycemic goals in pediatric patients. And so then when we pull the data for Texas Children's, we had about 221 patients that were less than or equal to six years of age out of a larger total of 3,600.

So this is a smaller, this is a niche. This is a very small patient population, but our mean A1C across the board, across all insurance, across all ages, irregardless of whether you were duly diagnosed or established, was about 8.5%. Of those kids meeting the goal of less than 7%, it was only about 17.6%. So this is now our burning platform.

form in which we emerge to develop our program and all of our QI projects. We have got to lower these A1Cs so our kids don't develop acute and chronic complications of type 1 diabetes. Next slide. So when you look at what type of insulin programs they're using, the vast majority, almost 50% when we began our program, were still on intensive insulin or fixed dose insulin regimens.

So what this means is that they're using both long and short acting insulin. They're

taking at least four shots of insulin a day, but there's no insulin pump use. Half of our patient population is still giving daily, multiple daily injections, basically. The automated pump systems are the automated insulin delivery devices in which the pump itself is linked to a sensor.

and is constantly changing the flow of insulin, hadn't fully yet emerged when we began the Young Children Diabetes program. There was a couple of systems out there, but the OmniPod 5 and the Tandem Slit system really hadn't come to the forefront. And so we had very few patients using these.

So we began in the summer of 2022. So you can kind of see as we emerge from COVID, now we're thinking of new things. And so we kind of formed our group and it's a group of multiple pediatric endocrinologists, advanced practice providers, nurse practitioners predominantly, diabetes educators and dietitians. And we have one diabetes psychologist who has worked closely with us because she cares for the younger children overall.

And then we began to really sit down and just come from the medical literature and talk amongst ourselves as to how we were going to approach this.

Our first thing that we did was to establish evidence-based diabetes care standards. And so we wanted to standardize how we approach this group throughout the division. What we didn't want was different people doing different things. We wanted to kind of sit down, this is how we're going to approach this. This is our goals for glycemic.

care. And we wanted people to use our guidelines to then branch off and be creative in caring for their patients. And we also wanted to use this to then establish and advance quality improvement projects that would hopefully lead to better diabetes-related outcomes.

We met over a period of 18 months, at least monthly. We broke it up into different topics. We had different people research different things and present it to the group. With the use of video technology now, it was much easier to meet and talk and discuss. But we went after glycemic targets, how to get more kids using technology, what the right doses of insulin were.

What do we start with and what do we end up with? How much long and how much short acting? What do we do when they get sick? How do we deal with all the rashes that come up when the kids are peeling off the pumps and sensors because it's itchy? How do we approach exercise and nutrition? And then the psychological impacts of living with type 1 at a younger age. What happens when the brain is

exposed to fluctuating levels of highs and lows?

We did publish our official guidelines through Texas Children's. They do have an evidence-based outcome center in which different divisions have published guidelines for different topics, whether it's bronchiolitis or sepsis. And so on this, I'm sorry, actually hospitalized website, we have an endocrine portion. And so under that is included the Young Children Diabetes Program.

is not available for anyone who is caring for a young child with type one.

Okay, so the first part of this was, what are our targets? What are we going to aim for?

So it is important to set forth an aspirational goal. If you say to yourself, well, I would never want to trigger a low blood sugar, so therefore I can never get the blood sugars within low normal range because the blood sugars might go lower, you will therefore never lower your average blood sugar, and you will always maintain a higher A1C.

And so in setting forth the glycemic targets, we had to aim high. And so we stated that we wanted at least 70% of numbers between the pediatric target range of 70 to 180. We were not going to shift the target or the target range to a higher values because they were little. We're going to use the same pediatric target range as the older patients.

And then we're trying to minimize the extremes. We want about less than 5% above 250 and less than 70. So we want the vast majority between 70 and 180. There will be some numbers that are in the low 200s, but we're trying to minimize the extremes.

And then in aligning with the American Diabetes Standards of Care, we do want that A1C less than 7. And so that is our goal. We talk about it actively in clinic.

In clinical care, because I'm a clinician and so is Sarah Kelly, you have to be flexible, right? I mean, these are our aspirational goals, but you have to be flexible.

Sometimes you have to meet the patient where they are. So if the child is having multiple episodes of hypoglycemia, if there is a barrier to technology use,

We have readjusted the A1C up a little bit higher, but we do not go up to the historical targets of 8.5%. We readjusted up to 7.5%. Next slide.

Blood sugar targets pre-meal, because we're going to talk about pre-meal dosing a little bit. We decided that if the number was between 90 to 150 before it was time to eat, we would go ahead and deliver pre-meal insulin. And so we were telling patients to aim for pre-meal targets between 90 to 150.

Once they were on an automated insulin delivery device, we could lower that

threshold even to 80 to 140. Parents will often ask us, well, like what numbers, where should the numbers be? What happens after they eat and so forth? And so this is really helpful so that parents knew that they were succeeding and being successful. If the number rose after eating, but it was back down between 90 to 150 before it was time to eat again, they were doing well. We also addressed bedtimes. And so anyone who has cared for small clinic, I'm sorry, cared for small children, know that bedtime is exceedingly important. We noticed a pattern in which parents were giving the kids lots of snacks or reducing insulin dosing to push the number up higher at bedtime so that the kids could ride it out overnight.

KR **Kelly, Sarah Renee** 13:46
Okay.

HK **Hicks, Kelly** 13:59
But this was causing really severe hyperglycemia overnight and kind of preventing us from reaching A1C targets. Now, with better improved technology, such as the automated insulin delivery devices, which Sarah will talk about in a bit, we were able to lower the threshold at which the bedtime number should be without pumping the kids full of snacks. And so we'll talk about bedtime targets up to about 150. but not trying to push the number up towards 200 or higher. So I'm going to pass to Sarah to now talk about insulin dosing.

KR **Kelly, Sarah Renee** 14:26
Um...
So once we'd established glycemic targets, our first process of care change was really to standardize initial insulin dosing for these little ones. We were coming from a time where there was wide variability in starting insulin doses. And so we developed guidelines that are now being used by our inpatient teams and our trainees that have really helped to reduce glycemic excursions with initial insulin dosing. The first piece is what is the A1C at diagnosis? So we know that with lower A1Cs, we caught this early. There's still more endogenous insulin production. And a lot of times you can get away with a basal only regimen. An important thing with basal or rapid acting insulin is that these families, they're little kids, they need to be able to do little doses and we need to give them the tools to be able to do half unit

dosing. With rapid acting insulin, that can be something like hemolog junior pen, but with long acting insulin,

The pins don't dial to half units. And so we are now providing vials and syringes and teaching families to use that so that we can better fine tune the basal dosing. We can start with basal only sometimes, but eventually you're going to start seeing that more prolonged postprandial hyperglycemia. And that's when you add in the rapid acting mealtime coverage. You may not need coverage for every meal in the beginning. It might just be like the larger meals. But it's really important that once you start to see that and you start to add that mealtime dosing, that you teach families from the very beginning

to always dose before the child starts to eat and not during or after.

If the A1C is 7.5% or greater, there are two questions that you should ask yourself that can kind of help you through our dosing guide. The first piece when it comes to basal dosing is, did they present in DKA? If the answer is,

Yes, then they're going to need a little bit more of a basal dose to help get them past that initial glucotoxicity and insulin resistance that you can see and really like not go back into DKA, right? So with basal dosing, this is the only piece where we make it weight based. And we recommend in either scenario starting with 0.5 to 0.6 units per kilogram per day.

And 50% of that should be your starting basal dose if they did present in DKA, and only 40% if they did not present in DKA. And when it comes to the basal dosing, it's important to know that you will need to be reducing that dose, especially these kiddos, honeymoon,

tends to start pretty quickly after we start insulin, and they need much less basal once honeymoon begins. And as Kelly mentioned, our goal is to find a basal dose that promotes euglycemia overnight without the need for uncovered bedtime snacks. When it comes to your bolus, rapid acting insulin dosing,

This is where we are looking at age. So with bigger kids, we have rule of 500, rule of 1500 that can help you to determine those starting doses. But we know that for very small children, those rules really don't apply. They're going to give you too tight, I mean, too loose of carb ratio. So they're not going to get enough insulin for their carbs with those rules.

And the correction factors end up being too tight in proportion to the carb ratios. So we decided to just start with, here's a carb ratio, here's a correction factor, start with this. And from there, it's pattern management. So for kiddos who are one to three

years of age, we recommend starting with a carb ratio of 1 to 40.

a correction factor of 200 and a target of 150 just until we can get them on technology that allows us to safely decrease that target. And then for children who are four to six years of age, we recommend starting with a tighter CARB ratio of 1 to 30, same correction factor of 200, but a lower target of 100. And as I mentioned, pattern management is key.

you will very frequently need to tighten those carb ratios and reduce the basals. So it's really just following the patterns.

One really important piece that has been mentioned a couple times, but the dose timing. This is something that makes such a big impact on overall time and range for these kids. Unpredictable eating habits can lead to a lot of parental anxiety.

If they're not sure how much their kid's going to eat, a lot of times the desire is to just wait and see how much they ate. But then the glucose has risen so much by the time we're giving the insulin that they end up riding the roller coaster. And I love roller coasters, but this one's not fun. Now, there will still be some scenarios where Premier dosing, we're talking about very small children, right? Like there are times when that may not be the best bet. One is if they're sick, like they've got nausea and vomiting, you're not going to be able to predict how much they're going to eat. They're really not feeling well. This is a time that it's okay to push that timing back a little bit.

As long as we assure the families that as they're feeling better and the intake becomes more predictable, we move back to premial dosing. Another scenario is, so a lot of these kiddos are in daycare or at school. And if the premial glucose is on the lower end, so between 70 and 90, this is a time when, if they were to not finish the meal, were worrying a little bit more about lows. So this is a time when maybe you can consider mid-meal dosing in certain scenarios. We, for our QI project around this, our aim statement was to increase the number of patients less than six years of age with type one who are receiving pre-meal insulin to greater than 80% by the end of fiscal year 2023.

This was the fishbone diagram that we came up with that helped us to identify barriers to premial dosing. And there were many barriers. This was a huge culture change for us. And so we're really proud of the work that we did, which you'll see the results for in a little bit.

Clinical pearls for premial dosing. So the first piece is, I don't know about you guys,

but I feel so much shame every Sunday when I get my screen time report. And unfortunately, as you guys, I'm sure have seen in clinic and in real life, young children are often exposed to a lot more screen time than we'd like. If we recommend no tablets, no TVs on, we really need to minimize distractions during meals so that they can focus. This helps to promote them actually finishing the meal. A lot of times, little ones have more of a grazing pattern.

And so if they've been snacking all day, then they're going to be less hungry when mealtime comes. And it's a lot harder to predict how much they'll eat. So we recommend to minimize snacking between meals that they're not yet predictably finishing. Another piece is this is really just something that I add in if I need to after. But there are some scenarios where despite our best efforts, we are still not always able to predict what they'll eat. Maybe they're always good about breakfast, but like lunch or dinner is hit or miss. In this situation, I will tell the family, okay, let's do this. Let's split the meal. How many carbs can they usually finish? And maybe it's 20 grams. Cool. Give them that as a first serving and pre-dose for it. Then are we still hungry? Great. Let's give another dose and then a second serving. If another piece that

really helped to provide confidence to our team was learning that if they finish a good chunk of the carbs, it doesn't have to be 100% of the carbs. But if they finished a chunk of the carbs, the low blood sugars that you would see don't happen immediately. You usually have up to two hours to get the remainder of the carbs in. So it's not an emergency. You have time. And so what we recommend is if they finished less than 80% of the dose for carbs, do use something or get the unfinished meal into them over that course of time.

This, I'm not going to spend time reviewing all of the details of, but you can scan this QR code. And this is a handout that we developed to help provide education to families and as a tool for our team as we gained confidence with this to help promote premial dosing. It also has problem solving strategies on the second page for special

scenarios that may arise. And one of the cool things that I love about this handout is that this graphic really helps to illustrate for families the difference that dose timing can make on glucose values. So you can see this bottom line is when you're pre-dosing,

The green line is when you administer the insulin right at the start of the meal, and the red line is post-meal dosing.

We implemented a series of bundled PDSA cycles. And so this is the run chart for our pre-meal QI project. On the Y-axis, you can see this is the percentage of families that reported during, on a pre-visit questionnaire that they were dosing prior to meals. And...

October of 2022, our baseline was only 50%. And we are proud to report, so by the end of September 2023, this was up to 86%. And now we are actually up to 95% of young children who are receiving pre-meal insulin, which has been incredibly helpful for us and we're proud. The next piece is, okay, so we've talked about insulin dosing, but how is that insulin delivered? So I'm going to talk a little bit about diabetes technology. So both insulin pumps and continuous glucose monitors.

When it comes to continuous glucose monitors, the first kind of piece is that these were a game changer for really helping to, so we're dealing with very small children who can't report, they're not always able to tell you like, hi, I feel weak, I feel shaky, I feel hungry to report their symptoms of hypoglycemia.

But having a tool that allows the parent to open an app on the phone and see what the glucose levels are and to receive alerts as the glucoses are dropping when they're low and alerts for highs has genuinely been a game changer. When it comes to diabetes devices, they all beep.

And there's so many alarms that can be incredibly helpful, but alarm fatigue is also a very real problem that our families struggle with. And so we came up with some guidance for our team on how to help program the alarm settings to make sure that the alarms are actionable, but also

avoiding alert fatigue. When it comes to insulin delivery methods, we recommend insulin pumps and automated delivery systems. And when we say automated delivery systems, as Dr. Hicks explained, these are pumps that talk to continuous glucose monitors and can actually help to adjust the insulin in the background to increase time and range.

So this is clearly the preferred method of insulin delivery for young children, but they're expensive. So if we have a family where there's no insurance, this may be a situation where it's not as practical of a choice, but we have really great insurance coverage for these systems. So many of our children, most of our patients genuinely are able to get it.

Pumps offer greater flexibility with insulin dosing. They can deliver that 0.1 and 0.2 units that you can't do with insulin pins or vials and syringes. And when it comes to

insulin pumps, it's really, we have found that it's very important to initiate the discussion about pumps soon after diagnosis.

before families have been doing injections for so long that the idea of changing to a different method feels scary and there's more resistance to it. So we do a two-week telemedicine visit right after they go home from the hospital after diagnosis. And that's when we start to discuss insulin pumps and often pumps are ordered at that time.

Dr. Hicks mentioned about skin sensitivity in this population. So this is a handout that was developed to help provide guidance and product recommendations for families. You're welcome to scan the QR code. And it can just help to address some of the common skin care concerns.

This shows the increase in insulin pump numbers in this population over the course of our project so far. So in the beginning, so back in 2022, there were some automated delivery pumps. There weren't as many options.

But this is the year that we got FDA approval for the first of them for children ages 2 to 6. So this is when you start to see some patients being managed with automated delivery pumps, but they weren't yet widely covered by insurance. And so by the end of fiscal year 2025,

coverage increase, but also we had really been advocating that pumps are the recommended delivery method for our children. And we are so proud that the numbers were up to 66.9% of our patients being managed with insulin pumps. And almost all of that, as you can see, are automated delivery pumps. This has been really impactful.

For.

HK **Hicks, Kelly** 29:39

Okay, so we set forth how to dose the insulin, how to use insulin pumps, and we also had to address the food. How do we feed our children in this population?

So what we realized in thinking about the food part was that we have amazing dietitians who were only meeting with our patients about once a year. And so if you needed more dietary support and help, because this age group is their dietary needs are changing faster. If we meet a infant

you know, six months to a year or so who is on a bottle. We don't want them to stay on the bottle for the next three to four years. And so when parents kind of got used to one way of doing things, it was harder to then change the insulin regimen, change

the food part. They needed really time to talk to a diabetes, I'm sorry, not a diabetes educator, but a dietitian to specifically address how their child's nutrition needs were changing.

We need to get kids, because what I was beginning to see as well as Sarah, was that a lot of patients were staying on the bottle for longer periods of times. There was a lot of formula being given overnight still with bottle feeds at bedtime. We were having a hard time introducing appropriate snacks if needed, maybe at daycare in Montessori, or just getting them to sit at the table and eat a meal. So we went to the dietitians and we said, you know, we want to establish better structure and how our little ones with type 1 diabetes

to eat. We also want to introduce what a healthy diet looks like because we spend a lot of time talking about carbohydrates, but we don't want to forget about protein and vegetables. We were pushing to give the insulin free meal, but if we're going to give the insulin free meal, we need to help the families understand what a normal meal would look like. And so we met with the dietitians first, and then we realized we need a plan of attack.

If they're going to meet with the patients more often, they need to be prepared to meet with the patients more often. We need to have note templates where they can easily get their notes done after clinic visits because they're seeing more patients overall. We need handouts ready to go that are very visual that parents will immediately take to and use. And then we also need to keep the kids occupied in clinic because as we're getting towards the end of a very long diabetes visit, The kids are starting to act up a little bit. They're getting antsy, and the parents want to leave. Next slide.

So our key drivers here in our aim statement was if we want to increase the rate of having at least two Rd. visits per year for this age group, our baseline was pretty low. We only had 10% of patients initially who were seeing an Rd. more than once a year. Because normally at Texas Children's, when you're diagnosed, you'll see a dietitian in the hospital.

the first fall visit, you'll see a dietitian to check in, but then that dietitian may not come back unless a provider specifically seeks them out. So in streamlining this, we wanted a way that without the provider really asking the dietitian to come in, that the dietitian was already ready to go and asking to see that patient. So our key drivers were getting the RDs engaged and they eagerly wanted more time with the younger kids. So that was not a problem at all. I

think they recognized that there was a great need here. We have clinic navigators that will look at the clinic schedule every week and kind of go in and determine who needs to see who. So we asked the clinic navigators to kind of change how often they were saying,

a patient has seen an Rd. So we want them to look for at least twice a year, so about six months apart, approximately, kind of go ahead and e-mail the RDs and say, hey, this patient needs to be seen. And then finally, patient time in clinic, just being aware. Maybe we don't say the dietitian for the end of the visit. Maybe they come in towards the front of the visit. Okay, next slide.

So this project extended over 2 years, and the run chart here is we kind of track our improvements. You know, our first PSA is really to meet with the RDs, and then we did spend a lot of time making sure that notes and handouts were ready to go. We have a way that we track our data using a program called ClickView, so we had to go into the program and change how often it was tracking

Rd. visits in clinic. And then we had to introduce it to the division at large. And so irregardless of what campus you were at, there may be a dietitian that approaches the physician or nurse practitioner outside the room and states, I would like to see this patient with you today. And for that person to be, oh, oh wow, I have a dietitian with me today, you know.

What we also decided to do was that because this was a pretty ambitious project, that we would pilot it at the main hospital locations first. So at our medical center, West Campus and Woodlands locations where there's also a hospital on site. We also had dietitians who were kind of the pioneers in doing this with us and were part of our program.

And so they agreed that they would be the first ones to test it out, to use the new handouts and kind of give feedback on what we could do better. You could start to see the line tick up though. And so then, oh, no, it's okay. By the time we went go live, yeah, it's starting to tick up because we're also talking about it. Some RDs might be seeking this out on their own. You can go to the next slide, Sarah.

KR **Kelly, Sarah Renee** 34:19
Sorry.

HK **Hicks, Kelly** 34:30
But as the fiscal year starts over on this graph, it's going to start over every single

year and how we count how many patients have been seen. By the time we go live in February 2025, I think we had worked out the wrinkles. And so by the end of the fiscal year, September 2025, we had about 68% of our patients who had seen a dietitian.

twice a year. Now, this product is in sustainment right now, and we have similar percentiles. We tend to hover in the upper 60s. I think what's holding it back is sometimes we do have Rd. staff shortages for whatever reason. And then patient time in clinic, because they're little, once the parents kind of get a handle on it and they

If you're incompetent and they've met the dietitian multiple times before, I think that they're like, oh no, no, we got this. And so I think we may need to go back and say, we still want to do a check-in. We still want to make sure that you're doing well. Next slide.

KR Kelly, Sarah Renee 35:22

All right. And I'm just going to review some practical aspects of insulin pump use in young children. And I wanted to go through, I thought a case study might be a really good way to show you these principles. So this is a 28-month-old with type 1 diabetes who was diagnosed at an outside hospital.

and managed for six months prior to transferring care to us. And on the left, you can see a screenshot of the CGM data prior to them being started on an insulin pump.

And they had not yet been taught the skills that

we teach to try to optimize time and range. And so what you can see is that the time and range at the bottom was 32%. And on the top screen, in range is here between 70 and 180. And so the glucoses were really elevated throughout the day, but with some sort of

steep drops. On the right, you can see that this is after the patient was started on an automated delivery insulin pump, but it's really before the doses on the pump were optimized and before the family really learned a lot of the skills that we teach. And What you can see is that even with the same behaviors, the time in range pretty drastically improved from 32% to 52% just because of the automated delivery that the pump was administering. So pumps can make a huge difference, but things can get even better.

I wanted to review some common patterns that you tend to see with little ones, and I'll try to be kind of brief with this, but on the bottom date, that March 10th, you can

see early morning hypoglycemia, which is really common in these little ones. And on the top, you can see something that we call desk phenomenon or these sort of like bedtime high glucoses, a lot of times you'll think, oh, you must be giving a snack, right? Like what are you feeding them? And the families will tell you, I'm not giving them a snack. Like I put them to bed and the glucoses just rise. And so again, now we recognize this is something that we call desk phenomenon, which we think has to do with growth hormone and those more complex carb meals that kiddos tend to have for dinner as opposed to the meals earlier in the day. Another piece is not just unique to very young children, but many people with type 1 diabetes need tighter carb ratios for breakfast.

 **Rodrigo Gonzales-Rojas** 38:00

Thanks, fine, so you will be one forty-fifty is a little while doing so, and I know he has.

 **Kelly, Sarah Renee** 38:04

Oh, sorry. And all right. And so don't be afraid, tighten those carb ratios as needed. You can see that there's much more hyperglycemia in the mornings here. Another piece is dose timing. So on the bottom day, you can see where the patient receives postprandial dosing for particularly like for lunch and for dinner. And this leads to steeper drops in the glucoses in addition to more hyperglycemia from the rise after the meals. Another piece is rebound highs. So this is when hypoglycemia is overtreated with too many grams of carbohydrate. And so this bottom day following the late sort of dinner dose, you can see that the glucose dropped and was overtreated and that leads to rebound ties.

 **Perlman, Jeremy S** 38:49

Thanks for that.

 **Kelly, Sarah Renee** 38:55

All right, so some clinical pearls to help improve time and range. One is keep tightening. I know you're probably tired of hearing me say this, but keep tightening the carb ratios if you're seeing postprandial highs. Another piece is for little ones, we use something called the Robin Hood approach, stealing from the basal and giving to the bolus.



Perlman, Jeremy S 38:57

But.



Kelly, Sarah Renee 39:16

As I've mentioned, they need a lot less basal insulin and more bolus coverage. So if the basal dosing is too high, then you don't have as much room to tighten the bolus doses. Also teaching adaptive hypoglycemia treatment. So I tell families to watch patterns. We recommend starting with a smaller number of carbohydrates to treat lows.

But if that number is still causing rebound highs, adjust it. How many carbs a child needs to treat hypoglycemia will change over time with growth, with activity levels, and whether they're managed with injections versus an automated delivery pump. Another piece is once they're on an insulin pump, it's okay to give corrections on the pump

anytime. So the pump tracks insulin on board and will subtract how much insulin it thinks is still in the system from previous doses. So it may say no dose recommended, right? And we don't recommend regularly overriding that. But I tell families that I want to empower them to

see if the pump will let you give a correction anytime that you're seeing high glucoses. Another piece is that for that desk phenomenon, I'll usually start with a looser carb ratio in the evenings to help families gain confidence with giving corrections when parents go to bed, but after the child has been put to bed when those glucoses are first starting to rise.

This is that same patient that I just showed you more recently. So you can see that the time in range is up to 81%. The average glucose, that dark line is within the in range zone really throughout the day, which is amazing. The percent of time with hypoglycemia has not increased. So

days feel smoother for this family. The roller coaster has been alleviated. And another piece that you can see on this slide is the Robin Hood approach in action. So you can see that only 25% of this kiddo's insulin delivery is coming from basal.

and the rest is coming from boluses.

On this slide, I think the first piece that I want to point out is all of these teal boxes with numbers are carbohydrates. This kiddo is eating throughout the day. They are

living a full, healthy, active life, and they still have amazing time and range. So really just kind of teaching the principles and adjusting the doses.

GS **George Sayegh** 41:31

Did you?

KR **Kelly, Sarah Renee** 41:47

can result in this, which is amazing. A few quick things. So on the top day, you can see the parents are giving little correction doses when the glucoses are starting to rise in the evenings, which helps it to come back down. And actually, the third day from the top has the same thing.

On the second day, you can see that they're treating the low blood sugars with just enough carbs to bump them back to in range without causing rebound highs, which helps to improve time in range. And then on the bottom two days, towards the left, you can see the family is going in and they're giving corrections at times that the glucose is

are high between meals, which helps to get the glucose down sooner.

This is a picture of the kiddo's pump setting. So you can see that the carb ratios are as tight as nine for the mornings for him. And this is working beautifully for them.

We're starting with carb ratios at his age. It would have been 1 to 40. So this just shows

tighten, tighten, tighten as needed. Another piece that this shows, the higher targets are sort of that Robin Hood approach. So it gives the bolus doses a soft place to land. And then the basal dosing on the left, you can see that it's programmed pretty low. This is it, but there's also an hour overnight where there's no basal programmed. And that's to account for lower basal needs during the early morning hours.

HK **Hicks, Kelly** 43:22

Okay, so kind of towards the conclusion of our presentation, we're talking about when they get sick.

Oh, and then, okay. So urine ketone testing can be rough when they're little. If they're still in diapers or pull-ups, you don't want parents testing urine ketones from old pee and old diapers. So we really kind of recommend using finger stick blood ketone monitoring, and we prefer beta hydroxybutyrate monitoring in the ear or in the hospital.

gives us a more rapid result. Insurance companies sometimes don't participate, and so we have appeal letters that we will sometimes submit on behalf of the patient, or we tell the patient just to go around insurance, purchase a couple of blood ketone test strips through Amazon using a couple of select ketone meters that we like to use. And so if we really are in urgent need to know what the ketone status is, we do a finger stick to check blood ketones.

Next slide.

We also have diabetes action plans, much like asthma action plans, but this is for diabetes. And so for those on pumps or shots, this is just kind of showing you in a quick visual. All patient families are given this, so we update it as needed throughout the year, but it walks them through what to do, how to reach us, but we really want them to start this chain.

before they reach out to us. Next slide.

Finally, the impact of highs and lows on little kids.

Chronic hyperglycemia is going to cause a whole host of problems. And so the whole point of this presentation was to show you a different way of doing things.

Traditionally, higher targets were advocated for little kids to try to avoid hypoglycemia. But with better technology that's available now, we can get more time within range and avoid the hypoglycemia.

If you let the higher A1Cs persist throughout childhood, it does increase the likelihood of executive functioning problems and learning problems. And I've seen this happen in clinic, unfortunately, may set them up for dementia as adults. We kind of have a view that the chronic hyperglycemia is a little bit more dangerous than if we have a low every now and then. Next slide.

For hypoglycemia, it's important to have a healthy respect for hypoglycemia. We do not ignore it. We do recommend that families with the younger kids treat with less carbohydrates if the child does have a low, so about 5 to 7 grams of fast-acting carbohydrates to bring up a low blood sugar. We don't do the rule of 15 or 15 grams because that's too much and they'll have a rebound high.

So we do teach a healthy approach and respect to hypoglycemia and we try to screen for and avoid a quote fear of hypoglycemia because if a fear of hypoglycemia becomes ingrained, it's going to lead to higher average blood sugars and higher A1Cs. We actually did find a screening tool for this and our psychologist members help with this. And so if we feel like that we can't get the A1C where it needs to be because the parents are resisting a little bit, trying to get lower average

blood sugars, we do use this validated screening tool. And then we talk about it in clinic and saying, hey, we might be developing an unhealthy fear about low blood sugars. And can we talk about that? What can we do to help?

Next slide.

Again, 5 to 7 grams is usually adequate to bring up a low blood sugar in a small child because we're trying to avoid rebound highs.

And then finally, exercise. This is a common question in clinic. And so our dietitians actually kind of helped us come up with this protocol. And so we broke it down to light, moderate, and strenuous activity. And then we detail what that was for little kids. So if it's PE at school or after care, the parents kind of know how many carbs to give, if they're on a pump, if they're not on a pump.

because that recommendation for 5 to 7 grams is for light activity. As the more active they become, we do up the amount of carbs. And so if they're doing swimming lessons, maybe it's a 30-minute swimming lesson, and maybe the parents tell us they do get a lot of time in the pool because maybe it's like 2 kids for 30 minutes. And so we're like, okay, and their parents are like, oh, they're always low afterwards.

there's the 15 grams of carbohydrates, but otherwise we're trying to get them to dial back the amount of snacks if the activity is not as intense. Next slide.

We also finally set the clinic follow-up recommendations for this age group. And so we want to see them more often. And so we have a streamlined protocol in which our scheduling team begins to make multiple appointments down the road at the time of diagnosis to make sure that we're getting them in in a reasonable period of time. And then we also have our psychology, dietitian, and social work teams.

who know when to see the patient and are kind of following their own protocol per se. The physician or the nurse practitioner doesn't have to go seek them out. They are there ready to go to see the patient. Psychology is available at diagnosis and we do pull them back in as needed if we recognize that the parents need a little bit more support. Next slide.

So finally, closing the glycemic gap here. The slide on your right is now showing you the number of patients in this age group who do meet ADA goals with an A1C less than 7%. And so at the time of our last counting, we had about 36% per, I'm sorry, 36% of patients that do have A1Cs less than 7%.

There is a disparity between public and private insurance. We began to see this emerge. If you have private insurance, you're more likely to find yourself in the group with an A1C less than 7%. The publicly insured patients tend to be less likely to meet

that goal, unfortunately. Amongst the publicly insured patients, we have dropped the A1C from 8, I'm sorry, from 9% down to 8.5.

but I think we still have a lot of room for improvement. So this now sets the stage for our next quality improvement project, which is going to take course over the next two years, in which we're going to identify multiple different PDSA cycles in which we can try to help get the publicly insured patients in the clinic or using Telemed and then remove any biases that may exist about the use of technology, CGMs and pumps.

work with the insurance companies kind of proactively identifying the DME company and making sure that they're getting their supplies as needed so that we can lower the A1C in this population. Next slide.

So finally, this is an old picture of us, but you can see on the left side, there's me, I'm kind of like top left, and there's Sarah Kelly, a couple other member, our team members, Dr. Usa was, she's kind of middle row top. She presented this at our regional meeting in New Orleans. I think that's where she met Dr. Lynch.

She has changed to a different, she's now in Atlanta, but she was also a key person who kind of helped push this forward. Dr. McKee, who was our QI advisor, and then all the dietitians and CDEs and nurse practitioners who worked with us to really make this a reality. I want to thank you.

Thank you for inviting us, our references, and finally our conclusion.



Sutter, Deena E 50:21

Thank you so much. That was an excellent presentation and we really, really appreciate you sharing that with us. We do have time for some questions if anybody has questions out there.

I, a little, maybe a little off topic, but my question is how, with these very young children, with these parents who are doing so much and with your multidisciplinary team, how do you deal with it when they start school, preschool, kindergarten, and you may have school nurses and teachers who are really unfamiliar with

Obviously, they have some idea of how to manage hypoglycemia, if they can recognize it. Is this an integral part of your clinic, especially because these kids are going to, maybe if they haven't gone to preschool, they're going to be sick over and over and over again. How does that work?



Hicks, Kelly 51:11

Yeah, I think I think Sarah and I can both probably get some insight. I talk about school as soon as possible, whether they are in daycare or not, start mentioning it. I mean, leading up to like a public based preschool program or private or even kinder in which they're going to be in school, potentially with a school nurse for most of the school day.

I do purposefully try to schedule more visits, more touch points so we can talk. They do have diabetes school orders from us, but then I also tell the parents deep breath. It's gonna take like two weeks to kind of figure out the schedule and the pattern. And then we begin to tweak it. Sometimes there is a tendency to wanna push the blood sugars higher when they're in a school-based setting to avoid lows.

But what I have witnessed over the years is that if the school nurse begins to see and witness really excellent glycemic control and feels confident and is included as a part of the team, you're golden. It takes a while to establish that, that we're not going to be afraid of lows.

But maybe we need to tweak some things because maybe there's recess, lunch, and then recess again. Maybe the insulin and carb that worked in July is not going to work now. Maybe we need to listen to the school nurse and back off a little bit. Maybe we do need to put in an unbolus snack there. So I think in telling the parents up front, we want feedback from the school nurse. She's a part of the team. We want to keep her included.

And if the school nurse sees the child do well, it really bonds that school nurse to the family. And then we take off. I don't know, Sarah, do you have anything else to?

 **Kelly, Sarah Renee** 52:43

Yeah, no, I think you covered it. It's, yeah, I love that you mentioned about establishing that really positive, collaborative relationship with the school nurse. I guess another piece is that our clinic has something called a school packet that has really detailed instructions for diabetes care at school. And Again, care is individualized based on kind of how we see things working out once we have some data after they've started school.

 **Sutter, Deena E** 53:12

Okay, that's great. Dr. Lynch has a question.

 **Lynch, Jane L** 53:16

Yeah, this is my second time listening and I learned more. It's fantastic. I think also making people aware that the worst question you can get asked for parents of a two or three-year old is, where's the best daycare in town for taking care of my child? And sadly, it's the public schools that provide the nurses right now. And it's a horrible dilemma here in San Antonio for families to find a place that will care for their child.

HK **Hicks, Kelly** 53:49

And we are asked the same question, like, is there the secret preschool that's amazing? And I, there's not just one. I think it's how you work with that individual school. There are scenarios, of course, where the daycare or preschool may tell a family we can't.

we can't do this. And I tell my parents, and move on. And don't try to force them to adhere to things which they've already told you they're not comfortable with. Let's keep going. Let's keep looking. We do train unlicensed diabetes, we call them the unlicensed diabetes associates, or I forget the full name, but

We do provide specialized video training for principals, teachers, et cetera. And so some preschools or private schools will do that training. And so that makes them a little bit more comfortable. But I think the parents have to do a little bit more if there's not a registered nurse on site. But if they start to get too frustrated because the school's rules are too rigid,

I tell them we just need to move on. We're not gonna get too like engrossed in this. Let's keep going.

KR **Kelly, Sarah Renee** 54:57

There's also, this isn't to do with preschools in particular, but one really great resource that I actually learned about from a family is called Type 1 Together. And if a family is looking for a babysitter that has type 1 diabetes and has experience with diabetes, there's, I think it's like a one time, very small fee.

And then they continue to provide updated lists of babysitters in the area that actually have type 1 diabetes, which is a game changer. So it's suddenly like date night is feasible, whereas otherwise this is something that would create so much anxiety for these families.



Sutter, Deena E 55:44

All right, any other questions out there?



Lynch, Jane L 55:50

Thank you.



Sutter, Deena E 55:51

Yeah, thank you both so much. That was really informative. And then for the audience, just remember to go ahead and send your text to the Cme chat. And I appreciate you both so much. Thank you. And everybody have a great Friday.



Kelly, Sarah Renee 56:08

Thanks for having us. Take care.



Hicks, Kelly 56:08

OK, thank you.

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