

# **Improving Glycemic Control in Non-Critical Care Units**

## ***Kristen Kulasa, MD***

Glycemic Control Bootcamp  
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PRESENTER: So Dr. [INAUDIBLE] will go back out and come back in with her moves. We'll get the music going. But she is an associate clinical professor of medicine in the Department of Endocrinology, Diabetes, and Metabolism at the UC San Diego Medical Center. Her role is the Director of Inpatient Glycemic Control, and she oversees the clinical diabetes nurse educators and leads the inpatient glycemic control committee for hospitals-- or hospital. In these roles, she's become recognized for her expertise, and she's an innovative leader. She's a mentor for the Society of Hospital Medicine, assisting other hospitals in improving inpatient glycemic control.

She got her medical degree from the University of Texas Health Science Center at San Antonio, and completed her residency in internal medicine and fellowship in endocrinology, diabetes, and adult metabolism at UC San Diego. But I will say that we've had the pleasure of hosting her, and she's a wonderful speaker, and we're really lucky to have her today. So without further ado, come on up. And to click through the slides, you actually just click this little-- it's the down one, not the up one. It's a little confusing.

PRESENTER: All right. Well, thank you very much. Thanks for having me for a day of glycemic control. So we-- Theresa and I-- are going to talk to you guys for the majority of the day about inpatient glycemic control. Maybe. I do want to acknowledge the Society of Hospital Medicine and Jane and Naina. A lot of the material that we put together for a similar talk, for the State of New York, with the help of Jane and Naina, who are both inpatient glycemic control experts in the state, and we work closely with the Society of Hospital Medicine for that.

We have no disclosures, and the agenda you have in front of you. So getting started with improving glycemic control in the non-critical care units. These are our learning objectives, so start here with our goals. OK? Where do we want our blood sugars in the non-critical care setting? So here is the data from the Endocrine Society and the American Diabetes Association. We are looking for fasting blood sugars less than 140, random blood sugars less than 180, with a goal overall of blood sugars between 100 and 180. So hypoglycemia per the ADA is less than 70, and severe hypoglycemia is less than 40.

So you guys, one of the Washington State Hospital Association metrics is less than 50. So that gets you right in there for some serious hypoglycemia. So this is just kind of a pictorial view of where we're trying to head. Ideally, we want to be between 100 and 180, with leaving 70 and 200 for our gutter balls, because less than 70 is where we're going to run into official hypoglycemia. So how do we achieve that? What do we do in the hospital to actually achieve those blood sugars? What do we do with our orals? OK, so typically we hold them all. This is straight out of the guidelines.

Non-insulin agents are inappropriate in most hospitalized patients. The problems with orals and non-insulin injectables is that they're too slow on, and they're too slow off. In the hospital, we've got things going at record speed. Somebody is going to be NPO for this procedure. They're getting infected with this. We're treating this infection, and now their requirements are coming down. So it's really hard to adjust the orals and the non-insulin injectables as fast as you might need. We're going to start somebody on steroids today. We need immediate glycemic control.

We're going to start somebody on TPN tonight. We're going to need immediate glycemic control. So here's an example of repeated hypoglycemia for a patient who received glyburide. So this is from our health records. We use Epic, and this is our glycemic management page. But here's a patient that received a dose glyburide. You can see they had one hypoglycemic event. You can just take that glyburide back. It's very long acting. And they proceeded to have another one, two, three, four, five, six events before that glyburide ran out. So that's what we would like to prevent.

So if we can't use our orals, what can we use? OK, we've got insulin. There's a lot of different insulins out there, a lot of different ways to dose it. So what do we do? Sliding scale, it's history. OK? This is where we're just treating a blood sugar when it's high, and doing nothing for a blood sugar when it's normal. OK? We need to prevent our glucose excursions up and down. We really need to match what our patient is needing, so that's where we come into basal/bolus. This is the most physiologic dosing of insulin, and that's how we're going to best match with what our patient needs. And therefore, the best way to avoid both hyper- and hypoglycemia.

And then of course, the insulin drip in the critical care setting, which Theresa will get to next. So when do we use basal/bolus insulin for our patient? Straight from the get-go. OK? Immediately at the time of admission. All patients with type 1 diabetes, they need basal/bolus insulin at home. They're going to need basal/bolus insulin in the hospital. OK, so you start them on basal/bolus insulin right away. Any patient with type 2 diabetes who's known to be poorly controlled, go ahead and start them on basal/bolus insulin.

You're going to end up having to titrate up, and that's the way you're going to find out what the patient actually requires. And then if you've got a patient with type 2 diabetes who's on several orals at home that we're then going to be holding when they come in the hospital, they're going to need basal/bolus insulin. If you have a patient who has what I call mild diabetes-- maybe they're well-controlled on one or two oral agents-- that might be a person that is OK to watch for 24 hours on correction scale only. See what they're doing in the setting of not eating and not feeling well, and then start them on basal/bolus insulin if their blood sugars are high.

But that's really the only group we need to be giving that 24 hours. Everybody else has either moderate to severe diabetes that we need to just start on a conservative, weight-based basal/bolus regimen. And then of course, during hospitalization, anybody who's above our target needs to go on basal/bolus insulin. What are other factors to consider when we are dosing our basal/bolus insulin? OK, so we have outpatient factors. What were they taking? Were they well controlled on one oral, or were they well controlled on four medications, or were they well controlled on 200-plus units of insulin? That's important.

Were they taking it? That's also important. Was it working? What was their diet like at home? And what was their activity level? Because those are all going to change when they come in the hospital. So typically, in the inpatient setting, our dietary changes lower the blood sugar, OK? Our activity changes, they're more sedentary. That's going to raise the blood sugar. Whatever they're coming in with, infection, illness typically is going to raise it. Steroids are going to raise it. Pressors are going to raise it. Parenteral nutrition is going to raise it. Our actual compliance with medication-- the patient actually getting it as prescribed-- that will lower their blood sugars. I can't tell you how many patients swear to me up and down they take this prescribed regimen at home, and I give it to them in the hospital and they come crashing down.

So we need to take that into account. And then, when we're writing these orders, when we're admitting the patient, it's important to know what they have on board so we can make sure we account for that in the timing of when we're starting our basal/bolus insulin. Did they just take 100 units of Lantus before they rolled into the ER? Did they just take a dose of 70/30? Do they have something on board? So this is what physiologic insulin looks like. Our bodies are making a little bit of insulin all the time, OK? Then you eat breakfast. It takes more. You eat lunch. It makes more. And then you eat at a buffet. It makes a ton.

So this amount of insulin that you need, aside from food, that's your basal requirements. The food coverage is your nutritional, and the correction is just what we need to bring you back to normal. These are the tools we have to try to mimic that pattern. OK? So we've got here our basal insulins. These are the long-acting, non-peaking insulins. Those are the ones we use to cover your basal needs. Then we have the analog insulins, which best match those little spikes for food coverage.

Here's an example in the background. This dark, tan part is what your body's actual needs are. So the basal insulin here. Then you've got your nutritional, and this is matching it with the insulins that we're using. So this is the long-acting, non-peaking kind. And then here is our analogs, because they best match those peaks. So this is what it's all about. It's all about matching what your patient needs, because that's how we're going to avoid hyper- and hypoglycemia. So the biggest name of the game is to understand what this dark, tan pattern is for your patient. OK? And that's what we're going to talk about today.

So our basal insulin, that's the long-acting, non-peaking insulin. The entire purpose of basal insulin is to suppress hepatic glucose production and ketone production. It is not meant to cover any food. OK? Therefore, it does not need to be held when a patient goes NPO if it is dosed appropriately. It is absolutely required in all patients with type 1 diabetes. They don't make any insulin. You need basal insulin to suppress ketone production. Without basal insulin, a type 1 will go into DKA. That is a CMS never event to have DKA in the hospital.

Most type 2s will also require basal insulin. And if you add up all the insulin a patient needs in 24 hours, about half of that can be allotted to their basal needs. So here's an example of a patient who goes NPO. The nurse went ahead and just held the basal insulin, because they're NPO. And you can see they became hyperglycemic despite not eating anything. OK? That need does not change. Basal insulin is not meant to cover any food.

Nutritional insulin, the entire purpose of nutritional insulin is to cover food. This is typically our rapid-acting insulin. Sometimes regular, usually analog. So this one should not be given to patients who are NPO. And the pattern at which you dose your nutritional insulin needs to match the pattern at which the patient is receiving the nutrition. OK? If they're eating three meals a day, it needs to match that. If they're getting bolus tube feeds five times a day, it needs to match that. If they're getting continuous nutrition, it needs to match that. OK?

And if you add up all that insulin a patient needs in 24 hours, this is the other half of their requirements. OK, here are some of the patterns. So here's a patient who's receiving bolus tube feeds or eating. OK, this blue bar represents their basal needs. OK? These red humps represent their three meals, OK? You can see how lovely these three red humps are exactly the same size. This is in a carb-controlled diet, receiving x amount of carbs, maybe three, three, three, five, five, five. Whatever you do, this is a carb-consistent diet.

If you are not paying attention to carbs at all, then this red hump might be up here. This middle hump might be down here, and maybe this hump is there. It's really hard to match with a consistent insulin dosing if their diet is not consistent. OK? So here's a patient receiving continuous nutrition. Again, you see they have the exact same basal needs, but now their nutritional pattern is different. There's a lot of different options and ways we can cover that red bar. OK?

When coming up with an option, one, it needs to be consistent across your institution, and two, it needs to take into account troubleshooting, because this red bar is not always so solid. OK? Patients pulling out their [? KO ?] feed, they're going NPO for a CT scan, NPO for surgery, high residuals, nurses holding, et cetera. So you have to plan for that. OK? So here, their basal needs are unchanged. You can use rapid-acting q4, regular q6, maybe intermediate q12, or long-acting q12 to 24. I know of institutions that use these. OK? There's some institutions that use this, this, this, and this. You just have to have the troubleshooting plan in place.

OK, at UCSD, we use regular q6. OK, so that gives us at least every six hours where we can go in and hold that nutritional insulin. We have a plan in place for that six-hour time period if the regular is administered, and then the tube feed gets interrupted. So you just have to have a plan in place, and your plan has to account for whichever method you picked. So here's our patient who's NPO. They still require the exact same basal needs, OK? Does that make sense?

If their basal insulin is dosed correctly, it shouldn't need any changing. So here's your correction insulin. The entire purpose of correction insulin is to treat a high blood sugar. It is also not meant to cover any food or any of your basal needs. This is the extra insulin given if your sugar's high. It should be the same insulin that you're using to cover nutritional. If you're using an analog to cover your meals, it should be an analog for your scale. If you're using a regular to cover, than your scale should be regular. This absolutely can be given when the patient's NPO, because it is not dosed to cover any food. It is dosed there to cover the blood sugar, if it is dosed correctly.

If your correctional insulin is required often or in high doses, you need to modify your underlying basal nutritional doses. This is your get-out-of-jail card, OK? This is when the family brings in Jamba Juice or Jack in the Box one night. This is going to help you get out of it. It

should not be your primary method of glycemic control. So here's just an algorithm of what we talked about, the different anti-hyperglycemic therapies. Insulin is recommended. We do not use orals or non-insulin injectables. Theresa is going to get into this side, and this is what we're going to be talking about, is our basal/bolus insulin.

So where do we start? Designing our regimen. We just talked about our basal, nutritional, and correctional insulins-- what they are, the purpose of them. So let's start with a patient. Here is our friend, Mr. G. He's 54-year-old, obese, type 2 diabetes for eight years. He's coming in with a diabetes-related foot infection. How many of you guys have ever seen a patient like this? OK, absolutely. We are going to put him on a controlled carbohydrate meal. His outpatient, he takes glipizide 10, metformin 1,000, and NPH 20. He weighs 100 kilos. He's got normal renal function with a creatine of 0.9. His A1C is 10, and his sugar in the ED is 240. Where do we start? What do we do with our friend, Mr. G? We'll get back to him.

So our principles of the basal/bolus dosing, because here's our friend coming in on three agents, none of which we're really going to use in the hospital. So we need to be putting him on basal/bolus insulin. Where do we start? First, we need to try to estimate how much insulin his body actually needs. If he came in with an answer key on his back, that'd be awesome. But patients don't do that, so we have to use a lot of clues to help estimate what his needs are. We need to figure out what we're going to do with him. Are we going to keep NPO for possible surgery for this foot? Or are we going to be working him up for osteomyelitis and feeding him while we are giving him antibiotics?

Then we take our total daily dose that we estimated in step one. We're going to divide it half and half. We add a correction scale to match the total daily dose, and then we assess blood sugars daily and adjust those insulin. OK, so step 1, how do we estimate? Without that answer key, how do we estimate? So for patients who are coming in on insulin, that's a good estimate of what they take at home. If they take 200 at home, chances are 20 in the hospital's not going to work, depending on their diet. Who knows? And consider their pre-admission regimen, and the control on that. What is their A1C on that 200? Is there A1C 4, or is it still 12?

And then we have weight. Weight we can always use, even if we're trying to use their home regimen as well. So a total daily dose somewhere between 0.3 and 0.8 units per kilo, depending on the sensitivity. We use the lower end, which is more conservative, in any patients with type 1 diabetes-- anybody who's particularly insulin-sensitive, elderly, renal impairment, or significant hypoglycemia risk factors. And then we use the higher end in patients who are known to be insulin resistant-- AKA type 2 diabetes-- or maybe that we're putting on steroids.

So our friend, Mr. G. He's not on a drip. We can't use that as telling us what his needs are. He's on orals and NPH as an outpatient, which we're not going to use in the hospital. So that leaves us with weight, OK? We can use something more conservative, since this guy has really never been on basal/bolus insulin. That would be 30. Or you can use something more aggressive, since he's on three agents and uncontrolled and obese and known to be insulin-resistant at home. So you can use any of those. Personally, I would go on the more aggressive side, somewhere around 50 to 60. OK, because he's overweight. He's known type 2. He's on three agents. And he's uncontrolled.

So assess what are we going to do with him. We're going to feed him a carb-consistent diet. Which pattern? This one. This is how we're going to match him. And then what ratio are we going to use? 50:50 is most typical. 50% of his needs being in basal. 50% nutritional. And then we need to pick a scale to match, OK? Our institutions should offer a variety of correction scales, because there's no one-size-fits-all in diabetes. You need a more sensitive one, and then at least a more aggressive one. Most institutions have at least two or three.

So we put a couple of these tables throughout the presentation to give you guys examples of what Theresa and I each do in our hospitals. So at UCSD, our order sets are all in Epic. Our blood sugar target's between 100 and 180, and we have three different-- actually, four different starting regimens. OK? We use 0.3 units per kilo with guidance in our order set for the provider to use if the patient's type 1, lean, or has any renal impairment. 0.4 you can use for pretty much anyone, and then 0.5 and 0.6 for somebody who's known to be insulin resistant, AKA type 2 diabetes, or that you're putting on steroids. And then we have three different correction scales.

At Virginia Mason, where Theresa's from, they have a computerized program, which is Cerner. They have the same target, 100 to 180, but they start everybody out on 0.3 units per kilo, and then they adjust up from there, based on their blood sugars. And they have a customizable-- they have a nifty little tool in their Cerner program that helps determine what their correction scale should be.

So getting back to our patient. He's pretty obese, so maybe we'll use the 0.5 or 0.6. He weighs 100 kilos, so being a little conservative, we'll use 50. We're going to feed him carb-controlled diet. We're going to use both the basal and the bolus at 50:50 ratio. That gives us about 25 units of basal insulin and 8 units of rapid-acting per meal. And you need a correction scale to match. At our institution, that'd be about a moderate. OK, now how do you write these orders? You came up with this beautiful basal/bolus regimen. How do you write it so a pharmacy can validate it, and the nurse can actually carry it out?

Order sets are so important to standardize and embed all the safety that you need in there. So ASHP, the American Society of Hospital Pharmacy, came up with expert consensus panel for practical recommendations to enhance insulin safety in the hospital. OK? So number one here is prescribing. The error is incorrect dosage or irrational insulin orders. Orders sets can help prevent all those errors, because you're going to standardize your orders and safety. So here's their recommendation. One, develop protocol-driven, evidence-based order sets for anything you can. Home to subcu, IV to subcu, DKA, anything you can should be evidence based and protocol driven.

So you want to eliminate the routine administration of your sliding scale, insulin alone as the primary strategy to treat hyperglycemia in most cases. Remember, we just talked about those very mild cases that maybe it would be OK for 24 hours. Everybody else should go straight on basal/bolus insulin. And then eliminate the use of free text insulin orders. In electronic and paper records, you really want to replace it with this protocol-driven, evidence-based order set that allows you to prescribe complex regimens, because the patient's requirement in the hospital is pretty complex, with a lot of moving parts on and off.

So what are the steps for developing these protocols and order sets? One, you can start with forming a glycemic control steering committee, getting all the necessary people at the table at the same time so that what you're developing is both evidence based, and it meets everybody's needs. You want to assess your current process and identify any barriers that you're running up into. Choose your best practices and preferred regimens that you want to standardize across your institution. Integrate best practices into your protocol. Crystallize your protocol into a one-page summary so that you can really get it out there, and it's easier for people to find.

Monitor use of your order sets and protocol. OK? If you build it, they won't necessarily come. You have to make sure they're coming. And if they're not, figure out why not. OK? Is there some barrier? Is it too hard to find? Do they not understand it? You have to be in touch with your people and figure out what's going on. Find your slow adopters to the protocol and intervene. Sometimes maybe the majority of providers are using it, and maybe there's one or two outliers, and you might need to approach them individually and do some one-on-one education. And then revise your order sets and protocol as needed. OK? Just because you build it, doesn't mean it's going to work for everybody all the time. And times change over.

So integrate the best practices into your protocol. Integrate your known glycemic target. Where do you want it to be? At our institution, it's 100 to 180, and that is consistent through all our protocols. Obtain an A1C. We've got it automatically checked in there. OK? Controlled carbohydrate meal plan. That's a project in and of itself. OK? But it should be supported in your order sets. Patient education plan and resources, so those get moving straight from admission. You don't want to wait day of discharge to start educating your patient. Hypoglycemia protocol needs to be embedded right in there. The coordination of your blood sugar monitoring, nutrition, and insulin. A prompt to DC the oral agents and really guiding the provider to using the basal/bolus insulin.

Insulin regimens for different conditions. OK, maybe we need to have one for meals, have one for continuous nutrition, maybe have one for steroids, whatever works. And then dosing guidance. OK? You want your dosing guidance built right into your order set so your provider doesn't have to go to two or three different places to get something done. Try to make it as easy as possible for them to do the right thing. So here's an example of our crystallized, one-page report of our algorithm. OK? Starting with step one-- no, you can't. I don't expect you to read this. By the way, it will be available for anybody interested in it. But really, at the top, it prompts discontinuation of oral agents. This is telling you how to dose weight-based, using the 0.3, 0.4, 0.5, or 0.6.

And then this step is for a patient eating three meals, continuous nutrition, or NPO, and how to split out the ratios. And then this is how to adjust on a daily basis. OK? So it is there. All those steps that we talked about is crystallized into one page. And on the back, it gives the definitions of your basal insulin, nutritional insulin, and correction insulin, really trying to reinforce throughout all our protocols and being consistent. It helps define our target and why we picked it. And then it has different links actually to the different protocols that we have.

So here is a link to our nutrition on hold unexpectedly guideline, a link to our transition from IV to subcu, and then our transition from inpatient to outpatient. So it's all there for the provider in

one easy step. So here's an example of our order sets, our insulin order sets, in Epic. Again, it is consistent with that one-page algorithm. Same stuff. Prompting them to discontinue the oral agent, a reminder for our glycemic target, and we just defined it-- 100 to 180 for everyone. And prechecked it, so they don't have to do anything. They actually have to go in there and adjust it if they want anything else.

And then this is a diabetes education order for the nurse to start on day of admission. Gives them a list of all the resources. It's prechecked. Nobody has to think about it, OK? The only thing the provider really has to do is down here, is pick which insulin regimen they want. OK? We have pre-fab orders sets here for all the different patterns. So for a patient eating three meals and requiring consistent-- the same insulin dosing per meal, then we have it with individualized dosing per meal. Then we have it for a patient getting continuous nutrition over 24 hours.

We have it in a patient getting nocturnal tube feeds only. We have a patient who's NPO, or different options. OK, so it's all set for there. Once they click on the pattern they want-- so here's the most common one, which is the basal and nutritional at consistent dosing. It has that guidance with those weight-based as a reminder to them. This is how we do it. OK, it comes with everything prechecked for them. All they have to pick is the dosing. So it's got their standard point of care, QACHS. It's got their Lantus once daily with all the indications and holding parameters built in. Nutritional insulin with all the indications and holding parameters built in. And then your correction scale.

So really all the provider has to do is what was that number we came up with? 25? Put in 25. Nutritional, what did we come up with? Eight? OK, put in eight. And then here's the scale. So we provide guidance right here. If the total daily dose is less than 40, they should be picking low. 40 to 60, moderate. Greater than 60, high. They click on it. This is what the scales are in case you wanted to know. And it's done. OK, our basal/bolus regimen is in the computer now with all the correct indication and holding parameters and guidance for that nurse.

So here's an example of Theresa's at Virginia Mason, OK? It's very similar in Cerner, and it gives them all the guidance. It reminds the prescriber what to order. So here is their basal, nutritional, and correction with that fancy little calculator that helps them pick which correction scale. So step 4 is there's no autopilot. OK? What we just came up with and all that weight-based is an educated guess, but it is a guess nonetheless. OK? It is a conservative guess so that we don't cause harm, but chances are we're going to have to go up on a daily basis.

So having all the necessary data in one place is very key. We want to reduce clinical inertia and make it as easy as possible for the provider to do the right thing. So many EMRs have a glucose management page, where you can consolidate all the data a provider needs to make those adjustments. Here's an example of ours in Epic. So you can see up here all the [? point-of-care ?] glucoses, all the chem glucoses, all the ABG glucoses. Any data having to do with glucose is going to show up there.

You can see here our creatine. Our A1C is going to show up. Any insulin infusion, any orals or insulin is going to show up here. Steroids are going to show up here, because that's going to make a difference, right? Diet is going to show up here. TPN, tube feeds. Everything we need in

one place. Here's an example of the one in Cerner for Virginia Mason, very similar. OK, they've even got the red, yellow, and green to help guide the provider visually-- or am I in the right place?-- consistent with their targets, and they've got their basal nutritional needs over here.

So again, all the information they need in one place. So here's an example of our daily adjustments. We come in. We've got our patient who's running up here in the yellow. They have persistent hyperglycemia. You can see down here that they're only on a correction scale. What do we need to do? What type of insulin are we going to add? Yeah, we can even add basal/bolus straight from the get-go. We have a patient on scale only for, unfortunately, more than 24 hours. They're above target. We initiate basal/bolus insulin. OK?

How long do you wait before you make further adjustments? 24 hours. Yeah. I've got some super, overzealous interns that are like, OK. I got it. The next blood sugar's still high. What do I do? Like, relax. Let it work. Let it work. OK, fasting hypoglycemia. Here we've got a patient here in the red zone. Fasting blood sugar is 65. Which insulin are we going to adjust?

AUDIENCE: [INAUDIBLE]

PRESENTER: Yeah, absolutely. And then here we have glucose variability. Blood sugars are all over the place. Theresa's coined this glycemic v-tach, which I love. OK, what's the problem here? Throw in the towel? It could be.

AUDIENCE: [INAUDIBLE]

PRESENTER: It's typically glucose variability. Here is a zoom in. So here's our patient over the course of the day going up, and then coming down at night. Going up, up, up all day. Down at night. So typically, yeah, glucose variability, it's not your 50:50. Your ratio is very heavy in one side or the other. OK? In this particular case, it's way too much basal insulin. OK? And this is actually a super common problem. We call it the creeping basal, like everyone's like, Lantus is safe. We can do it. And we just go up and up and up and up. And you still have these highs during the day, and then you're going to get into problems with lows in the morning.

So here's an example of what that creeping Lantus does. Your basal gets way up here. You're still not controlling your meals, and you're putting the patient at risk of hypoglycemia here at night. We really just need to adjust. We need to come down on the basal and up on the nutritional to match the patient's needs. So here's a summary. You want to really keep your ratio 50:50. Add more nutritional insulin when the daytime blood sugars are greater than 180, despite appropriate weight-based basal insulin.

You want to avoid too large of a percentage dose increase. You really want to avoid increases more than 20% to 30%, unless your initial dose was way off base to begin with. OK? If you take a 200 kilo person and start them on 10 of Lantus and three on lispro, you're going to be doing that for days, weeks maybe. OK? So start with a conservative weight-based, and then go up by anywhere between 10% and 30%. And then another error is if you don't adjust the insulin after any hypoglycemia. Clearly something went wrong, so you need to typically adjust down in at least one of your forms of insulin.

OK, I'm going to quickly get into carb-controlled meal plan. OK, this is a huge piece of the puzzle. So a controlled-carb meal plan is standard for patients with diabetes or hyperglycemia. We don't need to be restricting calories in these patients. We need to control their carbs and provide flexibility in both calorie content and food choices. OK? Snacks are not necessary with basal insulin and appropriate insulin dosing. You can have them there for patient comfort or nutritional needs, but the days of an automatic bedtime snack for NPH are gone.

OK, we don't need those with our current basal insulin, and then snacks can be provided based on patient need and choice and preference. So here's an example of a menu that has all your choices here, and it's labeled with the carbs. You can label with grams, you can label with servings, whatever you use at your institution. But it is a great teaching tool for the patient-- not only to figure out what they're going to do in the hospital, but try to apply that to their life at home. So they can help learn which foods actually have carbs, and maybe, if they're super advanced, get into an estimated portion of what makes up a carb serving.

And then coordination of that tray, the monitoring, and the insulin. Timing is everything here. The problems, common problems, are the meal tray delivery times totally vary from your kitchen. Your monitoring is way too early before mealtime. There's poor communication between the person checking the sugar and the nurse actually administering the insulin. The tray's delivered to rooms without any coordination with the monitoring or the insulin. Blood sugars are checked after the patient already starts eating. The nurse is worried about hypos and unwilling to give any insulin until the end of the meal, which is often delayed more than one hour post meal. Or room service delivers meals directly to the patient without any notification or coordination.

So what can we do to improve this? One, we want to try to minimize the time between your monitoring, your insulin administration, and your meal. So our goal would be less than 30 to 60 minutes. You want to implement a process where food services notifies the unit of tray arrival within 30 minutes so that blood sugar check can be done in a timely manner. Food service then can alert the nurse of the tray arrival to the floor so they know to go ahead and get that insulin going. And then reduce the number of staff involved in this process so that you can better coordinate and streamline.

So here's our approaches at UCSD. So we have carb-limited trays, which limit everybody to four servings per meal, or 60 grams. ADA recommends three to four for women, four to five for men. So we just do four for everyone. OK, so every patient gets four carb choices per meal, including on room service. They get a phone call from the kitchen. The unit gets a phone call from the kitchen 30 minutes prior to the tray arrival, so they're like, hey, we're heading up there. We'll be there within 30 minutes. That is the cue to whoever's checking sugars on the floor to go ahead and start checking sugars.

It's also on a schedule so that the nurse can use both the clock and the phone call to help remind them. The blood sugar check is done by the nurse 30 minutes prior to the mealtime, with the call from the kitchen as the reminder. And then the tray is delivered by food service staff, and they leave all the carb-limited trays at the nursing station in the little warmer so that the nurse can go in with the tray and the insulin. The blood sugar is usually already done.

We have two different hospitals. We have room service at one, and not at the other. So our room service also has time cut-off built in so that the patient on a carb-limited diet can only order one meal per three hours. OK? And we have room service attendants there who are in super close communication with the nurse, so they'll go in and they'll take the patient's order. They'll let the nurse know, hey, your patient just took an order. We just took their order. Their meal will be coming in 30 minutes, within 30 minutes. And then that serves as their reminder. And then nutritional insulin is administered with first bite, or we give, at our institution, up to 30 minutes after, if the patient has nausea or poor appetite, so we can match that hump.

Virginia Mason, they use all carb labels on the menu with no restrictions. You guys have room service? Yeah, and room service. Their kitchen staff notifies the nurse by the [INAUDIBLE]. The patient presses the call light when they order, and then the patient care technician comes in to check the sugar. The trays are delivered by the patient care technician or the nurse, and then their nutritional insulin is administered with the first bite of food. So you can see the themes are very similar.

So key points in our non-critical care. We're looking for blood sugar targets between 100 and 180 for most patients. We want to use physiologic insulin, which is basal and nutritional split at about 50:50, with a correction scale to match. We want to build clinical decision support into our protocols, order sets, and guidelines and hardwire as much as possible. Make it as easy as possible for the providers to do the right thing, and precheck as much as you can.

You need to have an EMR flow sheet to help pull together the required data and make trends more apparent, to help reduce that clinical inertia. Glycemic control is typically problem number 5, 6, 10 on the problem list, so if you want it addressed, it needs to be as easy as possible for the provider. Have a controlled carbohydrate meal plan with easy-to-understand menus for the patients, so that way they can help participate in their care. And then coordinate that tray delivery, monitoring, and insulin. OK, I'll stop there, and I think we'll do questions later.

AUDIENCE: [INAUDIBLE]

PRESENTER: Oh, yeah, nice!