

Perioperative Glucose Control: Creating a Shared Mental Model

2017

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Dr. Alan Jay Schwartz: Hello. This is Alan Jay Schwartz, Editor-in-Chief of the American Society of Anesthesiologists' 2017 *Refresher Courses in Anesthesiology*, the latest research and educational findings. The focus of the *Refresher Courses in Anesthesiology*'s CME program and the modules featured is to educate learners on current developments in the science and clinical practice of the specialty of anesthesiology. Returning for a second year, we will be speaking directly with individual authors to learn about their expertise, perspective and insight regarding the featured module.

Today, we are pleased to present the following one-on-one conversation with fellow RCA editor Dr. Samuel Wald and author Dr. Stephen Rupp. They will be highlighting the module titled "Perioperative Glucose Control: Creating a Shared Mental Model."

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Dr. Samuel Wald: Hello. We have Dr. Stephen Rupp with us here today. He's an anesthesiologist in the Department of Anesthesiology at Virginia Mason Medical Center in Seattle, Washington. Today, Dr. Rupp is going to be speaking to us about perioperative glucose control—creating a mental model. He'll be going over strategies to treat hyperglycemia and how to work as a team. Dr. Rupp, I'll turn it over to you.

Dr. Stephen Rupp: Well, thank you, Dr. Wald. This Refresher Course lecture is about the implementation of a program that we did at Virginia Mason Medical Center, based upon the American Diabetes Association and the association of – the Endocrine Society on management of hyperglycemia in hospitalized patients.

I think that the key concepts that we used are typified in understanding the normal plasma insulin curve in normal patients, and that is depicted in our figure 1, and it shows that there is a basal level of insulin that occurs in all patients and in normal people, and that associated with meals there are peak increases in insulin. And one of the fundamental things that we learned or we took from our effort is that the modern medical management of diabetes is to try and match this normal insulin curve in patients. Thus, patients receive basal insulin and nutritional or correctional insulin. Our model is shown in figure 2.

And a number of people recommend using an insulin infusion in the perioperative period. While this is very, very convenient for anesthesiologists, it is difficult for patients because it takes them off their normal daily regimen. What this model does is, it ensures that patients get their basal insulin. When they go NPO for surgery, they no longer take nutritional insulin. What it means for the anesthesiologist is that, when they're presented with a diabetic patient, the key thing that they need to be doing is searching for what the daily normal management is. So, they're searching for the patient's basal insulin, and then the amount of nutritional insulin that they take, and they're ensuring that they get their basal insulin on their normal schedule. This results in the ability for most patients who are not going to the intensive care unit to resume their standard insulin management at home much, much more easily, rather than having that disrupted.

Figure 2 shows that when patients are NPO, they're not receiving their nutritional insulin, and we have standard methods to monitor their glucose. Another key concept that we did in our shared mental model was to develop a

standard language for insulin vocabulary, based on these principles of basal insulin, nutritional insulin and correctional insulin. We embedded cognitive aids for our caregivers along the value stream so that they would understand the basic principles, that they're looking for the basal insulin and their normal daily regimen, but they would have cognitive aids that they could look and see as a reference.

And table 1 is a handy reference that shows all of the insulins that are available in the United States, and it categorizes them according to whether or not they're nutritional, basal, or a combination insulin. This allows you to very, very quickly interpret the patient's daily regimen and ensure that they get their basal insulin. We use continuous insulin infusions for those patients who are going to the intensive care unit and who are going to be sick, and that is consistent with the guidelines from the Society of Critical Care Medicine.

Another important aspect of our care is to take the instructions for preop out of the hands of the surgeon. There are so many surgeons that feed into the operating room, and all their offices, and so many different interpretations, that we centralized the instructions for preoperative diabetic care in our pre-anesthesia assessment clinic, and all patients are either seen or are called and are given very specific instructions. And those instructions are tabulated in table 2.

It is a protocol that basically hardwires the instructions for the patients to take their insulin for the day before surgery, and then the evening before surgery they get – you know, typically, the old way is, give half of their insulin. According to this table, the patients will either get all of their basal insulin or 80% of their basal insulin. And the table is also modified to show people who are on a clear liquid diet. Patients do not take insulin on the day of surgery before their check-in, but they do check their sugar. And then, when they arrive at the hospital in the surgery prep area, we test their blood sugar. We're

searching for their basal insulin to ensure that they've gotten their basal insulin on their normal schedule. That cognitive aid is included as figure 3. This has been very handy for caregivers, anesthesiologists, CRNAs, residents, to help standardize the care.

We have a standardized interval for testing. We test all patients who are being admitted, because it's very important to detect hyperglycemia in patients who do not have the diagnosis of diabetes. We do every-two-hour testing. And there are targets and triggers for action when the patient's blood sugar goes into the 140 to 180 range. There's instructions, and we're able to give appropriate insulin when we monitor blood sugar every two hours, and then ensure a hand-off to the team—the surgical team or the hospitalists—who are taking care of the patient after surgery. This has been very, very effective in reducing our incidence of hyperglycemia, and we've had a very, very low rate of hypoglycemia in doing this.

Finally, an important aspect of evidence-based care is to not continue oral hypoglycemics in the perioperative period for patients who are being admitted, and this is based upon the RABBIT trials that came out of Emory. And it's more appropriate to use weight-based insulin dosing regimen, and this has been very, very effective, particularly in type 2 diabetics who are on oral medications only. There was a recent article in *Anesthesiology* coming out of Emory in March of this year, 2017, that is very consistent with our approach and pretty much corroborates what we've been doing, and it's been very effective.

So, overall, what has happened is that we've been able to standardize the care, simplify it, take instructions out of the surgeon's hands, and then allow the entire team—the nurses, the anesthesiologists, the surgeons—to converge around a standard care that allows patients to get back on their daily insulin regimen after surgery while reducing the incidence of hyperglycemia and hypoglycemia in the perioperative period.

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Dr. Samuel Wald: Thank you very much, Dr. Rupp, for your wonderful summary of your Refresher Course. And I will turn it back over to Dr. Schwartz.

Dr. Alan Jay Schwartz: Thank you for joining us today and participating in this insightful conversation with this month's featured author. Be sure to join us for next month's one-on-one author interview. To purchase the full subscription of the 2017 *Refresher Courses in Anesthesiology* program, please visit www.asahq.org, click on the Shop ASA link, and search for RCA.

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