So the things I’m going to be talking about today, the talk unfortunately is a lot about what we don’t know, also about what we do. But we are going to be identifying the patients who are eligible for and can benefit from bariatric surgery. I want you all to have the skills to counsel patients on their expected outcome of diabetes remission based on the current evidence, be able to advise patients and surgeons of the importance of perioperative glucose control and how to achieve it, and to have patients – to have an inpatient diabetes management plan to keep patients safe from hypoglycemia and also surgical wound infections. And that includes some follow-up. Ultimately I’d like to optimize diabetes remission rate and length but we don’t know how to do that yet.

So this is Dr. Oz, maybe he’s a guru to some of you but I agree with his sentiment that we are not doing enough bariatric, gastric bypass surgeries specifically in the diabetic population. And what we are going to be talking about are the procedures, the benefits of gastric bypass surgery specifically, the predictors and the mechanisms of diabetes remission and then lastly the, the clinical aspect of glucose control. Very little is known about that but I’ll go through the updates of what, what studies actually have been done.

So this is the Roux-en-Y procedure, the most common and most well known. You could see here, there we go, a pouch is created from the top of the stomach, it’s about 10 to 30 cc of fluid available and that disconnects from the rest of the stomach and then the jejunum is transected and the distal portion is connected to that pouch and then the – is reattached farther below. So this segment here is called the biliopancreatic limb where the gastric and biliary and bile juices come in, and here is
where food travels, they don’t mix until this point which can be anywhere from 75 to 150 cm from the pouch.

Then we have adjustable gastric banding. You see here a band, a device is wrapped around the top of the stomach creating a similar size pouch and this tube coming out from it actually goes to a subcutaneous port which can be accessed by a surgeon with a needle containing saline, and so you inject or withdraw saline and there are inflatable pouches inside that band that expand and contract and that opens and closes the outlet and help determine how much food the patient can eat. So it is adjusted based on how nauseous they are, how much they are throwing up and how much weight they are losing.

And this not just a surgical technique, it’s an actual medical device so it has to be FDA approved. And the two that are approved are the LAP-BAND System and we kind of use that word like we use Kleenex, but that’s just one of them. And REALIZE is the newer version and the LAP-BAND has been around so long that it has achieved a new approval for patients whose BMIs are between 30 and 35 if they have a comorbidity. The REALIZE is still just between 35 and 40 for comorbidities, and above 40 for everybody.

Another surgery I’m not going to be talking about much today but is gaining in acceptance is the Sleeve Gastrectomy. You see there are no devices, there is no reordering of the digestive system, simply you are cutting off the greater curvature of the stomach and what – and turning the stomach
basically into a tube. But it does have significant benefits, it maintains the pylorus and possibly much less surgical comorbidity.

This is a brief slide showing that there is more and more of these surgeries being done very year, between 2003 and 2008 there was a – you know a 70% increase in the Roux-en-Y and a much more significant increase in the adjustable gastric band. And of course we plan on that number continuing to rise in the future.

So who can get these surgeries? This is the BMI chart. BMI is taking your weight in kilograms divided by your height in centimeters squared, but here for the Americans the pounds and the inches. Everyone find yourself on the BMI chart. The blue section is obesity, in general the yellow section overweight and the green is normal weight, purpose is underweight.

So the eligibility criteria, these are based on NIH consensus guidelines are what we use at UPMC. Anyone with a BMI greater than 40, which is usually about 80 to 100 pounds overweight regardless of whether they have an illness or not, and then BMIs between 35 and 40 if you have an obesity related comorbidity. So here I’ve listed several that count, type II diabetes being one of them as well as sleep apnea, obesity hypoventilation syndrome and then there’s others, fatty liver, pseudotumor cerebri, severe urinary incontinence actually can possibly qualify you. At UPMC we’ve done it between ages of 14 and 75, different centers have different age restrictions on who they are willing to
operate on. And of course surgery is not the first line of therapy for morbid obesity, it’s supposed to be the last. So you have to fail other attempts.

So who will pay for this? Medicare will pay for this, they’ve been doing it since 2005. You have to have medical documentation that you’ve failed weight loss attempts, you have to have a psychological evaluation, we’ll talk about that briefly. And it must be done at a center of excellence, so CMS has criteria for center of excellence which I’ll get to, and Medicare should cover 80% of the costs of a surgery so a patient still has a significant amount unless they have Medi-Gap or Medicare Advantage. The center of excellence definition, there’s a lot of criteria, these are the main volume associated ones. The center has to do 125 cases a year and each surgeon must have done 125 cases in their lifetime and do 50 a year, also significant followup has to be maintained so a center can’t just do a whole bunch of surgeries and never see patients again, they need to maintain continuity of care.

UPMC Health Plan does have coverage for bariatric surgery, specifically between the 35 and 40 comorbidity range they have stipulations and one is that the diabetics must have an A1C greater than 8 and be on more, one or more medications so none of my patients would qualify for bariatric surgery. That’s a joke.

So some of the exclusions are significant current psychiatric illness, not just someone who is on an antidepressant, someone with current drug and alcohol addiction and someone with a current active eating disorder, and that’s because of the failure rate. These patients either fail to lose weight because
they can’t follow the directions of the diet or the weight that they lose they are very likely to regain it. So they don’t benefit medically from the surgery, that’s why they should not get it.

So the mortality benefits, obesity kills people, this is not a cosmetic surgery. I don’t want to be fat so I’m going to get surgery. You know there has been studies you know kind of comparing this to smoking in terms of level of mortality and so here are some of the, some of the data you know for every 5 raise in your BMI above 25 there is a 30% increase in mortality, and men over 50 who are obese have a 2 to 3 fold increase in their risk of death. Disease specific mortality in type II diabetes is actually more – a greater increase in mortality than heart disease and cancer with a change in BMI. So the bigger you are the more likely your diabetes is to kill you. And then life expectancy is reduced by 7 years if you are obese by the age of 40.

A doctor’s surgery kills people too, that surgery is going to kill me. There is a mortality risk. Yes. Well you know they’ve compiled several studies and shown 30 day mortality in the Roux-en-Y gastric bypass, .2% if it’s done laparoscopically, 2.1% if it’s done open. Not that open is fundamentally so much more dangerous but the patients who have to have it done open are higher risk patients. The LAP-BAND, sorry the Adjustable Gastric Band it consistently has a lower mortality rate of .1%. You compare this to when diabetics get open heart surgery for coronary artery bypass their mortality rate is 7.3%. So if someone wants to complain about how we are killing .1 to .2% of our patients we say yeah, but what if they need a CABG 5 years down the line?
Well what is my patient’s mortality risk? That’s a population number, how do you know, what do you tell your patient about their risk of mortality? And they actually did an obesity surgery mortality risk score developed at one center with 2000 patients, and what they did is they took all the patients to find out who had operative mortality and found out the risk factors. And here is what they were. If your BMI is greater than 50, so that’s one; if you are a man, sorry; hypertension and being older than 45, and of course no risk factors for pulmonary embolism, and this is just a huge factor in any surgery surgical risk because being a thromboembolism is a major cause of perioperative mortality.

So then they took this study and they validated it with a 90 day all cause mortality in multiple centers and they found that this .2% is an accurate mortality rate for these low risk patients. And you know when you look at the population of people who have been having bariatric surgery it’s women younger than 45 whose BMI probably isn’t quite 50, who don’t have many comorbidities. And so that’s why the number from who has already had it is quite low, but if you take a you know 48 year old gentleman with a BMI greater than 50 and hypertension he’s already in the 2.4% operative mortality risk. Granted he also has a significantly higher mortality without surgery compared to the low risk people.

And then the ultimate thing, surgery saves lives, having this surgery if you live through it significantly reduces all cause mortality. And this is actually despite the fact that people who have had this surgery have increased accidents and suicides. You say well why is that? Well there might be an effect of just like antidepressants may increase risk of suicide, the very few people who are too
Depressed to kill themselves. But then there is also the fact of accidents. A lot of these patients are very homebound, they are not getting up, they are not walking around, they are not going on a hike, they are not driving cars. So that could be a significant component. Then risk of death specifically from diabetes is reduced 92%, coronary artery disease 60% and cancer. So when they tabulate all this they say you prevent 136 deaths per 10,000 surgeries.

Also people lose a lot of weight. This is a common graph that you see in tabulations of comparing the surgeries to each other and what you see here the biggest dip is the Roux-en-Y gastric bypass, so this is at one year they’ve significantly lost weight and then they gradually gain some back and plateau so that they lose 70% of their excess weight in the first year and after 15 years in large cohorts they maintain the loss at 50% of their excess weight. Not as good with the LAP-BAND or the old version that was not adjustable, the Vertical Gastroplasty. So does anyone know which diet and lifestyle recommendation results in a 50% excess weight loss after 15 years? None.

Now what I think is the most important part of this is the diabetes outcomes, and I show these pictures because this is what diabetes is to a lot of people. It’s making yourself bleed and stabbing yourself with needles, and all the diet restrictions that come with it.

So if you look at review papers over the last 10 years or so you often see this quoted number of 80% complete resolution, being normal glycemic off of medications after the Roux-en-Y and 60% after LAP-BAND after 2 years. So where does that come from? Well back in 1995 a paper was published
after 14 years of followup showing that 83% of patients with diabetes were normal glycemic off of medications. They also observed in that study that the diabetes improved before the patients lost any weight. And they also found that the patients who did not go into remission were older and had diabetes longer, so in 1995 we had a tremendous amount of information and we don’t have much more information than that today. But in 2004 metaanalysis with a lot more patients, 22,000 patients, who had had surgery only 1,000 of them had diabetes. So you can already see from that patients getting this surgery are not diabetic on large part, and they also showed the same number, this 83% complete resolution of diabetes.

Our very own former bariatric surgeon Philip Schauer at the University of Pittsburgh who is not at Cleveland Clinic published in 2003 data from our own patients, 191 who had the Roux-en-Y gastric bypass laparoscopically and had an 83% number of normal A1C and fasting glucose after surgery. This isn’t 83% off of medication, this is just 83% of people who had the surgery reached the optimum diabetes goals. But 80% reduced or eliminated their oral medicines and insulin and again they noticed their remission was less likely in people whose diabetes was more severe or who had it for a longer amount of time. So here is the data, the white bars are preop, the black bars are postop and the dotted line is the fasting glucose of 100, and you see significantly that the patients achieved the goal of a normal fasting glucose regardless of how long they had diabetes and whether they were on insulin, orals or diet controlled. Notice this diet controlled column, I don’t know what they mean by controlled there, their glucoses are not controlled. They are just being treated with diet. And here is the A1C in the same categories and you see a significant improvement in achieving A1C after
surgery, and there is a correlation here with the longer you’ve had diabetes the less your A1C goes down. And the more intense you were treated preoperatively, meaning if you required orals or insulin your A1C didn’t go down as far.

And they also claim in this, and this is still in Phil Schauer’s paper, that diabetes remission was immediate because they stopped the medicine before they sent them home. So if you are on insulin you are not as likely to go home not on medicine. If you’ve had diabetes for more than 10 years you are not as likely to go home without medicine. I’ll tell you what, I can stop everyone’s medicine and send them home, it doesn’t mean I did anything. So this is not in my understanding a measure of diabetes resolution, stopping medicine does not equal diabetes remission.

So what is the definition of diabetes remission? In 2009 the ADA put together a consensus panel led by John Buse at UNC and they did come up with an agreement, it wasn’t exactly a consensus but they wrote a paper and got it out there, and here is what they came up with, they decided to separate partial and complete remission and prolonged remission. So partial basically means off of medicine for a year you meet what we consider the diabetes or the prediabetes diagnoses standards. And complete remission would be meeting the diabetes or not even prediabetes, so an A1C under 6, fasting glucose less than 100 and maintain that for a year without treatment. And one of those treatments actually includes adjustment of the adjustable gastric band. So if you are going in and seeing the surgeon every month and they are putting in a little more saline or taking a little bit out that’s active management of diabetes in this guideline.
And then prolonged remission, and they will say they are okay with you using the word cure if you meet this, if it lasts continuously for 5 years. So here is what happens when you put a stricter criteria on the definition, less people meet the criteria. So in this group of 160 gastric bypass patients now it’s a 40% success rate in achieving complete remission for one year. Of course the other part of this is 32% of these patients were on insulin preoperatively, so depending on the patient population you are looking at that’s going to effect the number that achieve remission.

Okay, so my patient says is my diabetes going to go away? How do I predict? So in the Schauer study at UPMC he looked at whether if they were on insulin before surgery versus just orals whether that would create improvement. And they showed the people who are on insulin are less likely to come off of medicine and stay on insulin. So of the 52 patients who were on insulin 11 remained, and those 11 had gone from 146 units down to 45 units a day, so a significant decrease in the dose even though they stay on it.

Here they divided up by how long they’ve had diabetes, or how long they’ve known they’ve had diabetes, that’s a significant point to make. If you’ve had diabetes that you know of for less than 10 years you came off insulin, no one remained on insulin in this group. And if you’ve had it for more than 10 years you have about a 50% reduction. So you went from 22 patients who have had diabetes for 10 years on insulin preop and 11 remained, the same 11 that was on the graph one slide ago that when from 146 to 45.
So they compiled all of the evidence from their data and showed what were the predictive factors or what are the associated factors with diabetes remission. And you see the other ones with very low P values are percent estimated weight loss, so the more weight you lose the lower BMI you achieve that’s significant for predicting remission, and the duration of diabetes and the percent who are using insulin. Preoperative hemoglobin A1C has a P value of .03, so it’s trending that way but depending on your statistical model and how many patients you have it doesn’t show up as meeting the statistical significance in this study.

This is a different study just showing that the patients who lose the most weight are the ones who achieve remission. But how long since someone was diagnosed with diabetes and what medicines their primary care doctor or endocrinologist happens to have them on when they decide to get surgery are pretty rudimentary predictive tools. You know at the – you know is there a more fundamental way to measure scientifically what is their risk. And so looking at beta cell glucose sensitivity, which is a marker of how healthy your beta cells are and how well they work is really more of a controlled way of doing this. So they did the study with 32 patients, 7 on insulin, 3 on diet alone and did an oral glucose tolerance test, but not just a regular oral glucose tolerance test, they took samples for 3 hours and they measured insulin and C peptide which is cosecreted with insulin, has a longer half life and they could do mathematical modeling to determine how healthy the beta cell is and how sensitive it is to glucose based on comparing those numbers. And so they did that before surgery, 4 to 5 days after and a year after and defined remission as an A1C under 6.5, fasting glucose under
126, and a 2 hour glucose under 200, so this is really the partial remission based on the ADA criteria. 9 of these patients remitted before 45 days, 16 of them remitted by one year and 7 after one year still had diabetes.

What they found was the two things that predicted who would go into remission were the two hour glucose during the oral glucose tolerance test and the beta cell glucose sensitivity, which is a mathematically derived factor. And so you know they put this early, late and non-remitter at baseline and see okay, is this going to predict, is this beta cell sensitivity going to predict? So you see the people with the lowest beta cell sensitivity at baseline are the people who are the non-remitters. You also see at 45 days as a significant increase in beta cell sensitivity, so the surgery has improved the insulin and C peptide release compared to glucose during this test. Now in this study what they did not find was diabetes duration, antidiabetic therapy or baseline A1C, they did not statistically show a prediction, and that may have to do with it being a small number of participants.

So should we do this? Should we predict with this study to tell patients whether they have this? Well it’s pretty involved, stopping their medicine for 72 hours, doing an overnight fast, you know 9 blood draws measuring insulin, C peptide, not to mention hiring the mathematician who is going to tell you what that means. And if they are on insulin they have to stop that 16 hours, they have to switch from the 24 hour insulin to NPH a couple of days before, so it’s complicated, it’s not practical. So a simpler study or a measure of beta cell function would be pretty helpful because that
seems to be the predictor is how well their beta cells work. Just how do you, how do you measure it? And we don’t know.

Okay, so maybe my diabetes will go away. But will it come back? So there’s one paper on this, and measuring 42 patients. So you’ve got metaanalysis of 22,000 patients who have had bariatric surgery and we have data on 42 to decide if diabetes comes back. And what they showed was that 3 year followup, 64% in this population their diabetes resolved, and in 36% it improved. So everyone got better. And out of everyone 24% after getting better or improving it returned or got worse. So that’s about 24% not failure rate, but at least worsening rate that their achievements in improving diabetes were not permanent. And who are the patients that got worse? Well patients who didn’t lose weight in the first place, patients who regained the weight that they lost and patients who had a lower preop BMI. So it kind of makes sense from what Andy was talking about, if you have a BMI of 35 and you have difficult to control type II diabetes you are starting off with worse beta cell genetics. You’ve got weak cells that can’t tolerate weighing 210 pounds, compared to the people who have – who did not have diabetes until their BMI hit 50, they got much stronger potential in their beta cells to function normally when you take away the insulin resistance portion of their disease.

So here we compare the people whose diabetes came back versus the people whose diabetes stayed in remission, and the pink line is those whose diabetes recurred, a little upside down because this is comparing percent estimated weight loss, so they are the people who gained weight after 6 months.
The people whose diabetes stayed in remission were those that lost a little more weight and kept it off.

So how does this work, how does diabetes go away? I’m going to spend a brief amount of time on this. And the importance of this is of course that there are weight independent factors. Everyone knows that if you eat a lot less and lose a lot of weight your diabetes will get better and you won’t have to take as much diabetes medicine. But diabetes resolution happens before weight loss and there is better resolution when you have the Roux-en-Y compared to the LAP-BAND even when you lose the same amount of weight, so something else is going on. The other factor here I don’t have, people who have had Roux-en-Y gastric bypass, they are the people, a small number of them, who get hyperinsulinemic hypoglycemia, we have never seen that in someone who had a LAP-BAND.

So proposed mechanisms, David Cummings at the University of Washington is an endocrinologist who studied this extensively and has a couple of theories on it. The first of course is starvation followed by weight loss, we’ll get into the postoperative diet and you’ll kind of see what we mean by that. And the other three are the lower intestinal hypothesis, so if you speed up the undigested food getting to the distal part of the small intestine you increase the incretin factors GLP1, which is the hormone that comes from the gut stimulates insulin secretion that we use medically in terms of Byetta and Januvia and other such drugs. Then the upper intestinal hypothesis is that by food not touching the early duodenum that we are improving diabetes from the exclusion of nutrients to the early gut.
And here is a little proof for the lower intestinal hypothesis, they measured GLP1 levels after a meal and you see here this big spike, these are the Roux-en-Y gastric bypass patients. And down here at the LAP-BAND, so the LAP-BAND does not cause this increase in GLP1. This is the same study showing that – look over here first, the insulin spike is higher after the Roux-en-Y gastric bypass and this is the glucose, the glucose actually fell immediately after the meal in the people that had a Roux-en-Y gastric bypass. So we see these early hormonal changes, incretin changes based on the rearrangement of the gut.

The upper intestinal hypothesis is supported by this device here, which may be becoming more popular in the future. It’s called the EndoBarrier System, this is not a prophylactic, this is a sheath that is actually implanted endoscopically into the stomach and the wider portion here sits at the pylorus and this sheath protects the inside of the duodenum and the early jejunum from ever seeing any nutrients. So all of the brush border, all of the hormonal interaction between protein, fat and carbohydrates and the early gut is blocked. So in patients who have this implanted their diabetes gets remarkably better and they need a lot less diabetes medicine; small numbers of patients who this has been done in, but that supports the hypothesis that it’s food not touching the duodenum that is a significant contributor to the resolution.

Okay, so we know diabetes is going to get better in a lot of people and we know possibly who it’s going to get better in, but what do we do about it other than say yeah, surgery is okay, go ahead and
get surgery, that’s a good idea. You know us as people caring for diabetic patients have a role here. So first we look at all surgeries, not gastric bypass surgery but noncardiac surgeries in the hospital. And what’s the benefit of keeping their blood sugar under control?

So this study showed a lot of people have blood sugars that are pretty far out of control, 250 to – I’m sorry, 150 to 250 or at 250, this is an average blood sugar postoperatively, and they connect that with the rate of wound infections in the hospital. So clearly the worse your blood sugar is that’s correlated with more likely to have infections, and we all kind of understand that but there is evidence for it. Well what do we do about it? Put them on sliding scale insulin and see what happens. Well that’s done often, no offense to surgical health staff or medical health staff, but in the RABBIT 2 trial they actually put these head to head. They took the sliding scale regimen which I’ll call the health staff regimen and they put it up against the basal bolus regimen, putting someone on glargine once a day and prandial boluses before meals like we treat type I diabetics at home. I’ll call this the diabetes consult method. And what you see here is the diabetes is much better controlled, blood sugars reaching goals on the glargine and prandial bolus. We all kind of understand this to be true, but these patients also had less surgical infections, so there clearly is a way to control blood sugar after surgery.

What about specifically in gastric bypass? Well okay, you know thousands of patients with type II diabetes have had gastric bypass, so we probably have a lot of data on this. No, there is one study and what they did was they took patients who had gastric bypass surgery who had diabetes
preoperatively and they put them on q six hour sliding scale versus giving them glargine once a day plus a sliding scale. Now these patients are not eating anything, so there is no preprandial fixed doses at this point, they are on a clear liquid diet. And they give them .3 units per kg and sliding scale if their sugar was over 144. And they showed they had better average glucoses, and out of you know 1000 glucose measurements only 3 were less than 60 and they were not dangerous. So putting your patients on .3 units per kg glargine does not induce any clinically significant hypoglycemia at any significant risk. So the conclusion was that this is safe.

What about when they go home? What do you put them on when they go home? You can do Lantus in the hospital, okay, or Glargine in the hospital. And the only study about postoperative glucose control that’s published I could find is not really about glucose control at all. They took Metformin, solid pills and they gave it to patients who before they had gastric bypass and after and they just proved that yes, you will absorb your Metformin whenever you take it, even if it’s in a solid form. But there are guidelines, even though there is no evidence, and you look at the endocrine guidelines, Endocrine Society Guidelines on management of – postoperative management of weight loss surgery and in Section 3 they have reported this: we recommend postoperative glycemic control to get an A1C less than 7%, fasting glucose less than 110 and postprandial less than 180. They also suggests that doctors and nurses know what they are doing in the hospital, and that patients with type I diabetes continue to get insulin, scheduled insulin and they also recommend treating cholesterol problems the same way you would treat cholesterol problems before bariatric surgery. I did not find any of these guidelines remarkably different, there doesn’t seem to be any change compared to
people who have not had gastric bypass, and this is the only recommendations from the Endocrine Society.

Then I go to (inaudible), UpToDate.com to see what they had to say about how to treat these patients. And I don’t know if I’m allowed to quote UpToDate.com on here without reference, but what they said was monitor the blood sugar often. This is in the hospital, this section. Monitor the blood sugar often and treat them with sliding scale insulin. Many diabetic patients have decreased need for insulin after bariatric surgery. I think a bariatric surgeon wrote this section of the talk.

They also say oral sulfonylureas and meglitinides should not be used because of the risk of hypoglycemia. I think that’s true, I agree with this completely. They say Metformin is the safest oral drug because it doesn’t cause hypoglycemia or fluctuations in glucose, I support that as well. And some people experience gastrointestinal side effects, but they also say Metformin should be administered in liquid form or immediate release preparation which can be crushed. Now we know from an absorption standpoint this isn’t true, but I think it might be true from a surgical standpoint of can the patient take any pills, you know are they worried about outlet obstruction with pills. So that makes sense if they are on a clear liquid diet and you can’t take any solid pills that you need to give a liquid form, but it’s not about absorption of a medicine.

So what I think we should do, and like I said we are getting to the point here where there isn’t evidence behind this, but I would base postoperative diabetes management based on the
postoperative diet. So here is what these patients actually go home and eat. For the first two weeks they are on a clear liquid diet, they have to have 64 fluid ounces a day. It’s sugar free, noncarbonated, decaffeinated. If it’s fruit juice it has to be dilute or it’s broth or it’s tea or sugar free Jell-O, Crystal Light, so they are not having sugar, barely having any carbohydrates for two weeks. The second two weeks is, and this is after the gastric bypass, the adjustable gastric band it’s the same diet but it progresses a little bit quicker, but here the pureed diet for two weeks and they are supposed to get the same fluids, they start some chewable vitamins and then they have high protein things that they don’t have to chew, yogurt, cottage cheese, eggs, tuna, pureed beef, you know at least 50 to 60 grams of protein a day. So a month after surgery they then advance to the advanced, the adaptive soft diet, which is just more solid food, fish, shell fish, things you have to chew. And they also add some low fat, low calorie starches, fruits and vegetables, canned fruit, cooked vegetables and then this oatmeal, mashed potatoes, cereal, boiled pasta. I would argue if you have a diabetic patient who is not having completely normal blood sugar at this point in month 2 and 3 that they should be eating the fruit and the cooked vegetables and they can avoid the baked potato and the mashed potatoes. They don’t need starch, they are trying to lose weight as fast as they can. And then Phase 4 the stabilization, so by month 4 there is no restriction in the consistency of what they eat and they can get into 3 meals a day but again they are eating high protein, they are supposed to eat their protein first because that’s the thing that’s going to prevent muscle wasting as they continue to lose weight. And then they advise one serving each of a fruit, a vegetable, a starch and a fat. So you put the fruit, vegetable and starch together and you are probably around 30 grams of carbohydrate per meal.
So the evidence that we have here to put together a plan for how to treat these patients is that postoperative Glargine and sliding scale is safe and achieves better blood glucose control, maybe decreases infection that specifically hasn’t been looked at yet. The post operative diet is 2 weeks of a liquid fast, 2 weeks of pureed proteins and then 2 months of a solid but low carbohydrate diet. And we know the Metformin is well absorbed.

So here is my conclusion, this is not evidence based that preoperative control to a goal A1C might or may improve beta cell function and diabetes remission. No randomized control trial has shown this yet, it should be done if it’s not currently being done. The glucose control should be achieved with basal insulin and sliding scale in the hospital and that Metformin should be added as an outpatient. And the doses of basal insulin should be titrated for a normal glucose under 120 and that you would decrease the dose of their basal insulin if their blood glucose fasting falls below 70. If they are well controlled on minimal doses of insulin at 6 months when they’ve already lost a lot of weight doing a trial of Metformin alone would be appropriate. And to consider discontinuing Metformin if their A1C falls below the prediabetes levels, if their A1C is less than 6 that’s when you would say should I stop the Metformin. Your patient will probably be anxious to stop the Metformin just to say to themselves I’m not taking diabetes medication, but we haven’t looked into this yet. Personally I don’t see a reason why anyone who tolerates Metformin who has a diagnosis of diabetes in remission should stop it because it may be the thing preventing their diabetes from coming back.
So I have some questions. We don’t have the audience response system for this but I do want people to raise their hands. These questions are not hard, but I like to get people involved.

So which of the following patients would qualify for bariatric surgery? 12 year old girl, BMI is 35, she has asthma and sleep apnea. Anybody? Okay. A 38 year old man, his BMI is 50, he has sleep apnea, he has never dieted in his life and he doesn’t want to try? Okay. 52 year old woman, BMI is 39, type II diabetes, on insulin, failed Weight Watchers, Adkins and she placed last on Season 27 of the Biggest Loser? And we got some yeses there, okay. A 58 year old woman, she’s a well insured ICU nurse, her BMI is 35.5 and she has absolutely no medical problems? No. Good job. Okay, hey doc, hey nurse, I’m a 46 year old man with uncontrolled type II diabetes, hypertension, mild coronary artery disease and a BMI of 51, will bariatric surgery kill me and should I get it? Okay, A: no and yes. B: yes and no. Alright, C: well you are at higher risk of death from surgery than most, 2.4% but less risk than if you were to have a coronary bypass. If you are among the 97.6% who survive you are likely to live much longer than if you didn’t have the surgery. You should get it. Alright or D: yes and yes. That’s correct. D is very wrong. All right. Who will be on insulin 3 years after surgery, this might be trickier, a guy who has had diabetes for 2 years, his A1C is 6.2, he’s on 10 units of Lantus, Metformin and Byetta and he achieved and maintains 80% weight loss. Is he going to be on insulin in 3 years, or is he going to be on insulin? Okay. Someone who has had diabetes for 12 years, their A1C is 5.8 on 5 units of Levemir, they are allergic to all orals, he eats a very high carb diet before the surgery? Okay. C: someone who has diabetes for 20 years, their A1C is 14 on Actos and Glipizide, they had a 2 hour oral glucose tolerance test showing 450 mg per deciliter and they
have undetectable insulin and C peptide and they’ve had several admissions for DKA? Yes. And someone who had diabetes for 3 years, their A1C is 9 on Metformin, they lose 20 pounds and they gained 80 pounds? That’s tricky. Okay, if we are going for the best answer, it’s C, D, yeah that’s a possibility. And the last one, a 45 year old woman on 120 units of Lantus and 5 mg of Glipizide is getting gastric bypass surgery in 3 days, what is your inpatient glucose control plan? Okay, hold the Lantus the night before, start sliding scale insulin postoperatively, send her home on nothing and claim she had immediate diabetes resolution? Continue Lantus and Glipizide at home doses, have her drink sugary beverages to prevent hypoglycemia. Okay, decrease her Lantus to .3 units per kg the night before surgery, continue to postop, correct hyperglycemia with sliding scale insulin and consult endocrinology for dose titration and followup, or inform her that surgery will likely not result in remission and that she should avoid surgery and should continue medical therapy alone for diabetes and obesity. All right. Very good. Any questions?