ENDOCRINOLOGY UPDATE

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From the Division of Endocrinology and Metabolism

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Message from the Chief

Dear Colleagues:

I would like to introduce you to the Division of Endocrinology and Metabolism at the University of Pittsburgh, which recognizes the importance of ongoing cross talk among researchers, clinicians, and educators in working toward the common goal of disease prevention and treatment.

Patients are seen at several clinical sites affiliated with the UPMC Center for Diabetes and Endocrinology (CDE). Within the CDE, there are multidisciplinary programs for patients with diabetes, obesity, thyroid disorders, osteoporosis, pituitary and adrenal disorders, and rare genetic syndromes. A system-wide program of Diabetes Self-Management Education provides patients with the information necessary for successfully managing their disease. A telemedicine program was established in 2007 for patients without direct access to an endocrinologist, allowing for even broader extension of the high level of care we provide.

The scope of research and practice by faculty is particularly important given the increasing prevalence of diabetes, some of which can be attributed to the increasing prevalence of obesity. Two physicians in the practice have board certification in obesity medicine as well as in endocrinology and metabolism. Through their efforts, a physician-supervised weight loss program is available for patients who may not be candidates for, or may not want to undergo, bariatric surgery.

Research into the causes and treatment of endocrine disorders is an integral component of the Division's work, with current funding by the NIH, the American Diabetes Association, and other groups. The research expertise takes place at the bench as well as in clinical areas with participation in several high-impact NIH sponsored clinical trials. The Center for Mitochondrial and Metabolic Medicine (C3M) was established in 2014 as a collaboration between the Division of Endocrinology and the Vascular Medicine Institute to address the contribution of metabolic and mitochondrial perturbations to cardiovascular disease and endocrine disorders. Research performed in the Clinical and Translational Research Center (CTRC) facilitates the translation of C3M research into strategies for clinical diagnosis and treatment.

In addition to clinical care and research, the Division is dedicated to educating and training future scientists and endocrinologists. There is a critical shortage of clinical endocrinologists available to meet the needs of the growing numbers of people with endocrine disorders. Five physician trainees are accepted into the fellowship program in Endocrinology and Metabolism each year. For trainees with an interest in a research career, a longstanding NIH training grant provides dedicated, funded time for trainees to work with a faculty mentor while they develop expertise and independence.

More information about division activities appears in the following pages. This includes information about a weight loss program started in the Center for Diabetes and Endocrinology by David Rometo, MD; a description of the Glucose to Goal Program led by Linda Siminerio, PhD that integrates diabetes educators into the multi-disciplinary approach that helps patients achieve desired levels of diabetes control; a protocol that guides management of patients who use insulin pump therapy during surgical procedures by Sandra Sobel, MD; and an introduction to a newly arrived member of the research faculty — Michael Jurczak, PhD. In addition, Maja Stefanovic-Racic, MD, Endocrinology Fellowship Program Director, worked with Karen Selk, DO, a first year endocrine fellow, on a case-based review of insulin management in a young hockey player with type 1 diabetes. I hope you will find these pages informative.

Mary T. Korytkowski

Mary Korytkowski, MD
Interim Chief, Division of Endocrinology and Metabolism

Exercise-Induced Hypoglycemia in Type 1 Diabetes

Karen Selk, DO

Maja Stefanovic-Racic, MD

Case Presentation

A 27-year-old male with a 15-year history of type 1 diabetes mellitus treated with a continuous subcutaneous insulin infusion using an insulin pump presented to our clinic for diabetes management and specific questions regarding how to adjust his insulin therapy for sports-related activities. His diabetes was well controlled with a hemoglobin A1c (HbA1c) of 6.6%; however, he reported frequent symptomatic hypoglycemia occurring two to three hours following hockey games which involved 1-2 hours of high-intensity exercise several days a week. Hypoglycemic events persisted despite basal rate reductions of 75%, prompting recommendations that he suspend insulin delivery during the hockey game then use a 20% basal rate reduction for two hours following each session. He monitors his finger stick glucose levels at least once during breaks and then more frequently following exercise. These interventions reduced the frequency of hypoglycemia events in this patient, who continues to play hockey on a regular basis.

Discussion

The U.S. Department of Health and Human Services currently recommends that all adults over the age of 18 perform moderate-intensity exercise for 150 minutes per week. Exercise is an important component of diabetes management as it promotes cardiovascular health, weight loss and weight maintenance, insulin sensitivity, and improves quality of life.[1] However, aerobic exercise also has the potential to increase risk for hypoglycemia particularly in patients who are on intensive insulin therapy to achieve recommended levels of glycemic control.[2,3,9-11] Fear of hypoglycemia is one of the most common barriers to physical activity in the patient population with type 1 diabetes.[4] There are currently no formal recommendations that guide insulin adjustments in patients with type 1 diabetes during and after exercise.

Aerobic exercise increases risk for hypoglycemia in people with type 1 diabetes by several mechanisms. These include a depletion of glycogen stores in the setting of reduced hepatic gluconeogenesis due to peripheral hyperinsulinemia.[5] In the presence of insulin, exercise increases blood flow to muscle, stimulating the transport of glucose transporter isoform 4 (GLUT4) from the cytoplasm to the cell membrane and allowing glucose entry. Exercise also increases GLUT4 expression, independent from insulin, resulting in a further decrease in circulating glucose levels.[6] Individuals with type 1 diabetes can also have blunting of their counter-regulatory hormonal response to exercise, with an impaired ability to produce sufficient glucagon and catecholamines to prevent hypoglycemia.[3,7]

Hypoglycemia may occur less frequently when exercise is performed in the morning, but there is still an increase in risk for these events for up to 24 hours.[10] McMahon et al observed an increase in glucose requirements during and up to 10 hours post-exercise performed in the afternoon in adolescent subjects with type 1 diabetes.[8] In one study examining methods for preventing hypoglycemia in patients treated with insulin pump therapy, 49 subjects with type 1 diabetes found that temporarily suspending basal insulin for moderate intensity exercise performed in the afternoon reduced but did not completely eliminate the risk of hypoglycemia. Among patients who continued their basal insulin, 43% developed

hypoglycemia as compared to 16% who suspended their insulin infusion.[9] In another study, reductions in post-exercise hypoglycemia and hyperglycemia were observed following reductions in basal rates of 50-80% during and two hours following exercise performed in the afternoon.

Patients treated with multiple daily injections (MDI) using a basal-bolus insulin (BBI) regimen have less flexibility than those who use insulin-pump therapy. Ingestion of low glycemic food items with a reduction in prandial insulin doses following exercise can decrease the frequency of short-term hypoglycemia but do not protect against overnight episodes.[11] When this strategy is applied in conjunction with a 20% reduction in basal insulin doses, reductions in both short term and overnight hypoglycemia have been observed.[12]

Conclusion

In summary, individuals with type 1 diabetes often limit regular physical activity due to concerns for hypoglycemia. Individualized modification of the insulin regimen can be effective at reducing risk for hypoglycemia and encouraging patients to meet recommendations for exercise. Patients can be instructed to monitor their blood glucose more frequently before and up to 24 hours following exercise as a way of detecting any trend toward a hypoglycemic event. While insulin pump therapy offers some advantages over MDI in allowing more flexibility in dosing, individualized modifications of MDI-based regimens can also be successful in minimizing risk for hypoglycemia in patients who engage in regular physical activity.

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Glucose to Goal: Integrating Diabetes Educators Into Primary Care

Linda Siminerio, RN, PhD

Diabetes is a lifestyle disease that requires the person living with it to make many daily decisions about diet, activity level, and medications, as well as adequate support to manage the disease successfully. Research has shown that diabetes educators and a team-based approach to care are effective ways to help people with diabetes manage the disease, prevent and treat complications, provide behavior-change strategies, and cope with the emotional challenges this chronic disease brings.[1-3] In a meta-analysis of the effect of diabetes education on glycemic outcomes, hemoglobin A1c (HbA1c) reductions were directly associated with the number of contact hours between participant and diabetes educator.[4] Diabetes educators are highly skilled at addressing both clinical and behavioral needs, yet their services are underutilized. Recently released data show that only 6.8% of insured,[5] newly diagnosed adults with diabetes and only 4% of Medicare participants received education.[6] The problem may be related to the fragmented way in which diabetes education services are delivered. Patients typically receive Diabetes Self-Management Education (DSME) in outpatient hospital-based programs that are distinctly separate from primary care (PC), where more than 90% of patients receive diabetes care,[7] limiting coordination of services.

Our PC model positions educators to support PCPs in proactive management through advanced identification of diabetes patients utilizing EMR capabilities and collaborating with PCPs and patients on shared treatment plans to assure patient-centered approaches to care.

Changes are underway in the U.S. health care paradigm with attention to PC practice. The patient-centered medical home (PCMH), a model with a focus on patient-centered approaches, is being widely implemented. Elements that are central to the PCMH — decision support, practice redesign, population management, and electronic medical records (EMRs) — have not been systematically and fully applied to, or realized by, most diabetes educators.

Our team at UPMC, which employs diabetes educators in 20 hospital-based American Diabetes Association (ADA) recognized DSME programs, are established leaders in advancing quality diabetes care. To gain their perspectives on current delivery at their hospital-based programs, UPMC hospital diabetes program coordinators (n=21) were surveyed. Only 33% of the diabetes education coordinators said their outpatient services are being fully utilized; just 16% reported being satisfied with the number of referrals. In addition, it became obvious that diabetes educators relying on their hospital-based EMR had limited opportunity to directly communicate with providers who are using a distinctly separate outpatient EMR system.

In separate interviews, UPMC primary care providers (PCPs) said an office visit did not afford adequate time to educate patients, and that they would prefer to have additional time and access to on-site diabetes educators. Given quality initiatives introduced to primary care, UPMC PCPs responded favorably to the proposition of developing and implementing a model that systematically offers assistance with diabetes management consistent with the PCMH. PCPs agreed that the traditional diabetes education delivery model does not adequately support a patient-centered approach, which requires collaboration and effective communication.

In response, we organized a new delivery model that addresses the myriad needs and requirements of modern-day diabetes management. Our PC model positions educators to support PCPs in proactive management through advanced identification of diabetes patients, utilizing EMR capabilities and collaborating with PCPs and patients on shared treatment plans to assure patient-centered approaches to care. The model also allows for individualized attention and the time necessary for planned, coordinated care that is often unavailable in a busy practice. To set the model apart and communicate it in "user-friendly" language, both educators and PCPs agreed that the program be named *Glucose to Goal* (fully recognizing that diabetes education goes beyond limited attention to glucose management).

To determine if the deployment of the model was effective, three diabetes educators were introduced to practices in their respective urban, suburban, and rural communities. They proactively identified diabetes patients through the EMR system, reviewed patient lists with the PCPs for referral to educator services, and worked collaboratively with PCPs and their patients. The program's impact was assessed by evaluating changes in HbA1c, blood pressure, weight, height, and lipids. Pre-baseline HbA1c levels were reviewed to affirm that patients had been in poor control prior to receipt of educator services. Pre-baseline was 3-6 months prior to initial educator visit and baseline was immediately (as close as we could in capturing lab value) prior to the diabetes educator visit. Data was again reviewed at 6 and 12 months after DSME. Findings from this study were presented at the ADA Scientific Sessions in June, 2015.[8] For the total population, 73.6% had baseline HbA1c above the general ADA recommendation of <7% for patients with type 2 diabetes. Mean age of the population was 61.3±1.0 years; blood pressure (mmHg) and LDL (mg/dL) were relatively controlled in the total population, as per ADA guidelines. The overall population had a BMI (m/kg2) that was categorized as severely obese (35.9±0.7).

Figure 1 illustrates that pre-baseline, patients had been in poor control. However, from baseline HbA1c when DSME was initiated there was a significant reduction after DSME at six months. The reduction was sustained at 12 months.

Patients' values were then categorized by HbA1c: ≤7%, >7 to <9, and >9%. Figure 2 represents HbA1c values according to these categories. The blue line represents HbA1c levels in those patients with ≤7%. There was a very slight decrease from baseline at DSME initiation and at six months, that was maintained at 12 months in these patients. We suspect these small changes may be from the trajectory and/or the treatment in the disease process.

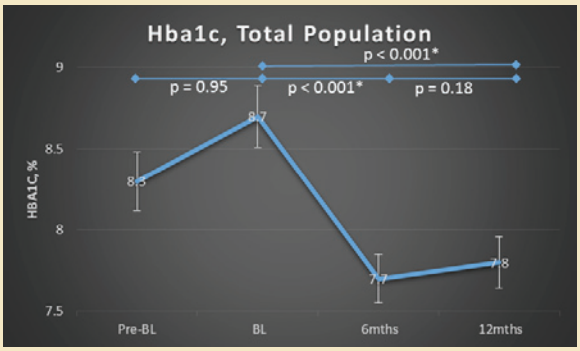

FIGURE 1. Pre-Baseline

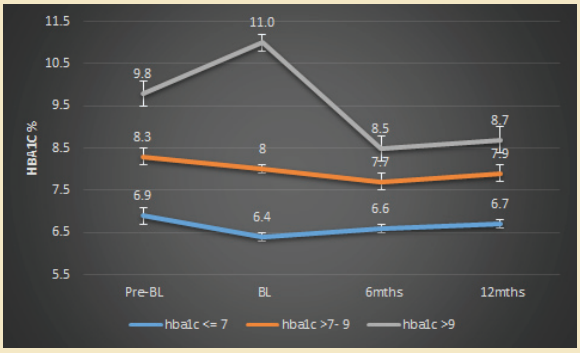

FIGURE 2.

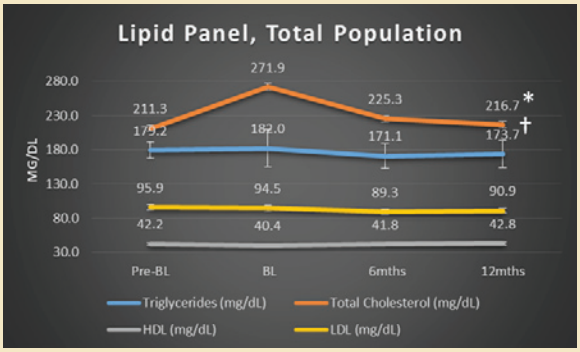

FIGURE 3. *Total Cholesterol: BL vs 12 mths p = 0.007
†Triglycerides: BL vs 12 mths p = 0.004

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Glucose to Goal (Continued from Page 5)

The orange line shows those individuals with HbA1c values >7–< 9%. HbA1c decreased significantly from baseline when DSME was initiated and was maintained at six months, and throughout to the 12-month follow up. Strikingly, for those at highest risk, with HbA1c values >9%, levels decreased significantly from baseline following DSME initiation and were maintained throughout the 12-month study period. This is certainly an audience of patients that can benefit from additional attention.

Figure 3, Page 5, shows that in the overall population, there was a significant improvement in triglycerides and total cholesterol levels from baseline following DSME initiation through 12 months. Neither systolic blood pressure nor weight changed significantly from pre-to-post intervention.

Our findings demonstrate the feasibility and potential effectiveness of this novel educator-practice based approach at improving glycemia in diabetes patients and lowering triglyceride levels, which could be indicative of a positive impact on lifestyle changes.

These findings reaffirm the benefits of education in all patients, particularly for those at high risk, advocating for sustained involvement of a diabetes educator to help facilitate lasting improvements on glycemia. We recognize that changes in medications that occurred during the study period were not reported, though this model did reflect a team approach with both the provider and educator contributing to possible initiation and support of therapy intensification.

There were undocumented successes that were noted. Patients reported better communication and support. Educators noted an increase in patient access and participation, and all participants, patients and providers, reported that they "liked" the "true" patient-centered approach. Since there was no predetermined diabetes content that was expected to be delivered, the number of patient DSME sessions/visits varied during the course of the study. DSME visits were based on the individual's needs, expectations, and, of course, reimbursement. PCPs reported that they benefited in sharing the workload and having additional support to provide quality care. In today's health care environment quality translates into humanistic and cost savings.

Findings suggest that a PCMH approach that addresses and links to diabetes education may be an effective way to improve diabetes control for patients with elevated HbA1c values, especially patients at high risk. Further research is needed to confirm these findings and explore ways to enhance the role of diabetes educators in the primary care setting to support providers and patients in diabetes management. UPMC has taken this model seriously and has moved forward in deploying hospital-based educators to support its network of primary care practices throughout western Pennsylvania.

Continuous Subcutaneous Insulin Infusion (CSII) Perioperative Glycemic Management Protocol

Sandra Indacochea Sobel, MD

Diabetes technology is an ever-evolving field that often aims to improve glycemic control of the individuals who utilize the technology while also attempting to simplify certain aspects of diabetes management. This is certainly true as it relates to the increased use of insulin pump therapy among people with both type 1 and type 2 diabetes, especially here in the United States.[1] Insulin pumps, or continuous subcutaneous insulin infusion (CSII) therapy, involves having a continuous infusion of insulin delivered in the subcutaneous tissue of the individual wearing the device, and allows the individual the flexibility of adjusting the insulin infusion rates based off of activity level throughout the day, and bolusing insulin prior to meals or snacks to prevent uncontrolled glycemic excursions resulting from food ingestion. Individuals wearing this device often become well versed in understanding the technology and manipulating the CSII apparatus to try to achieve their individual outpatient glycemic goals.

As an increasing number of individuals with diabetes opt to use CSII therapy for glycemic management, medical professionals are now more frequently encountering challenges of how to best address the care of these same individuals within the hospital setting. This has been particularly true in regard to elective surgical procedures. We know that maintaining perioperative glycemic control is important in reducing post-operative complications, such as wound infections or delayed wound-healing, but how to do this in an individual on CSII therapy has not been clear.[2-4] Some hospitals approach this challenge by recommending that CSII therapy be discontinued in situations when it cannot be managed directly by the patient.[5,6] Patients undergoing surgical procedures often have altered levels of consciousness for variable time periods, making them unable to appropriately self-manage their pump or reliably report symptoms of hypoglycemia. In addition, perioperative insulin requirements may differ from usual requirements due to the stress of surgery and reductions in food intake. Finally, with the variety of CSII technologies available, it is impossible for the surgical team to be familiar with the nuanced management of each device.

Evidence-based guidance for management approaches to individuals on CSII therapy during the perioperative period was lacking. Specifically, there was little published literature addressing safety and efficacy regarding the continued use of CSII therapy in the perioperative period.[7-11] Therefore, we convened a multi-disciplinary group at UPMC comprised of endocrinologists, anesthesiologists, pharmacists, nurses, and medical professionals from ambulatory surgery to develop a CSII perioperative glycemic management protocol (PGMP) to standardize the management of patients on CSII presenting to the Same Day Surgery (SDS) unit for elective surgeries (Figure 1, Page 8). This was developed into a quality improvement project to track the results of the protocol's use in an attempt to evaluate its safety and efficacy. Efficacy was defined as first postoperative capillary blood glucose (CBG) ≤ 200mg/dL. Safety was defined as incidence of hypoglycemia (CBG <70mg/dL), pump malfunctions or other potentially harmful incidents due to use of CSII. These results were collected, reported, and published in the November 2015 issue of *Endocrine Practice;* a summary of our findings are found in Table 1, Page 8.

Consecutive adult patients using CSII who were admitted to SDS for elective surgical procedures between June 1, 2011, and May 31, 2013, were identified by nursing personnel. The CSII-PGMP consists of an algorithm guiding the management of patients admitted with an insulin pump for elective surgery (Figure 1). The algorithm provides instructions for management according to anticipated length of the procedure and need for hospital admission. Information guiding procedures for continuation or discontinuation of CSII therapy with conversion to intravenous (IV) insulin is included. The CSII-PGMP was made available to all anesthesiologists caring for patients on CSII at time of admission to SDS, and although use of the CSII-PGMP was encouraged, the attending anesthesiologist reserved the right to manage the patient's CSII as per their usual care (UC), which could vary in approach from one anesthesiologist to the next.

During this time period, 49 patients treated with CSII therapy underwent 57 surgeries. Patients with type 1 diabetes mellitus (DM) had 35 surgical procedures, and those with type 2 DM had 20 procedures. One surgical procedure was performed on a patient with transplant-related DM and another in a patient with cystic fibrosis-related DM. The majority of patients

CSII (Continued from Page 7)

were female, and there were no differences in A1c or duration of diabetes when comparing patients with type 1 and type 2 DM.

The majority of procedures (75.4%) were managed according to the CSII-PGMP. Of these, 36 patients remained on CSII for operative glycemic management and seven were converted to IV insulin as per the protocol. In 14 cases the CSII-PGMP was not followed (usual care, UC group), and no documentation was available specifying why the choice had been made to forego the CSII-PGMP.

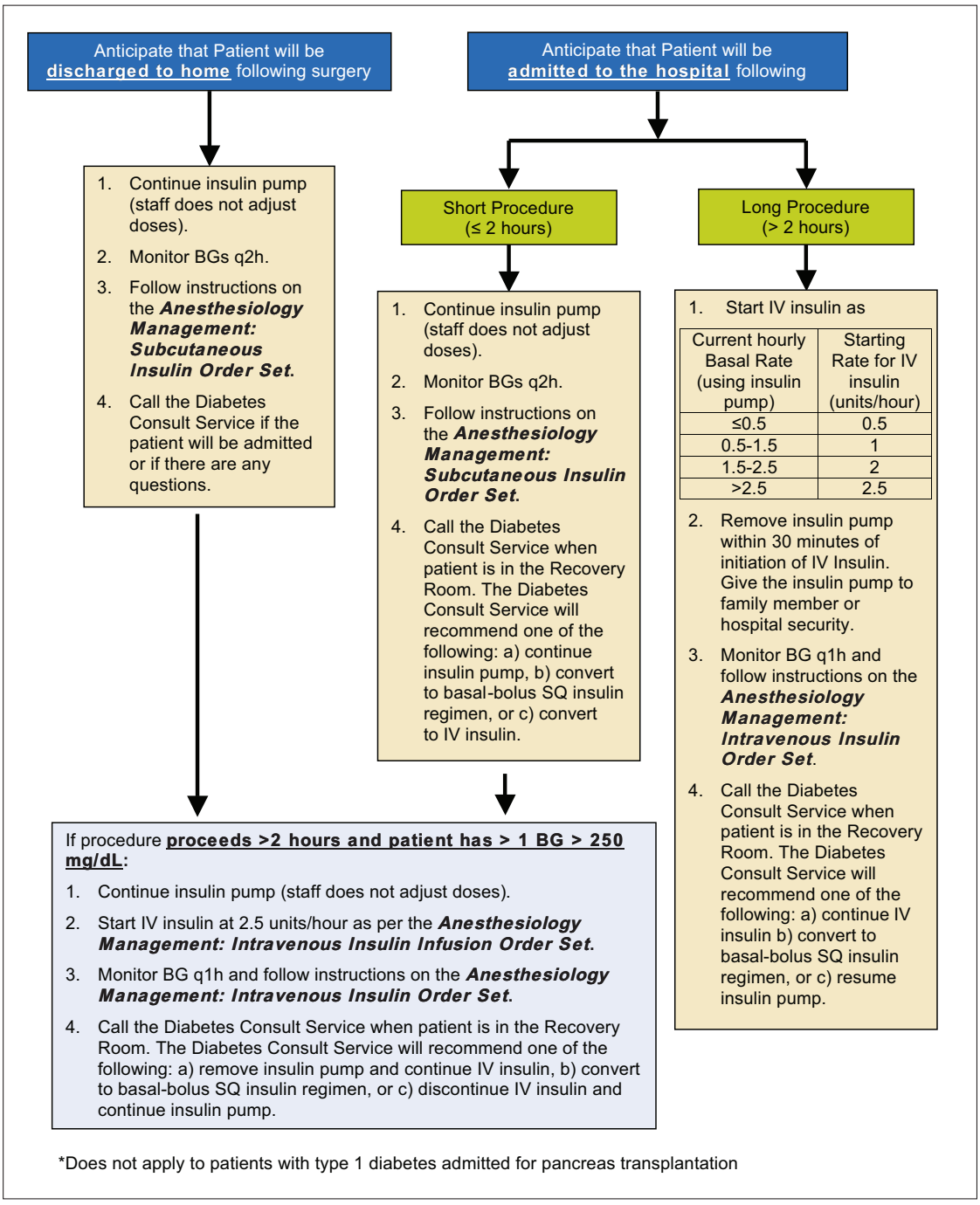

FIGURE 1.[13] **Insulin Pump (CSII) Patients: Protocol for Insulin Management in Same Day Surgery (SDS)***

Reprinted from *Endocrine Practice,* 2015 Nov; 21(11):1269-76. Sobel SI, Augustine M, Donihi AC, Reider J, Forte P, Korytkowski M. Safety and Efficacy of a Perioperative Protocol for Patients With Diabetes Treated With Continuous Subcutaneous Insulin Infusion Who Are Admitted for Same-day Surgery. Copyright 2015, with permission from the American Association of Clinical Endocrinologists.

The mean pre-operative capillary blood glucose (CBG) was 181.1 ± 68.9 mg/dL in the CSII-PGMP group, and the majority of patients had a first post-op CBG of <200mg/dL, with a mean post-op CBG of 175.6 ± 66.8 mg/dL (Table 1).

TABLE 1. Efficacy and Safety of CSII-PGMP in the 57 Procedures

Outcome	CSII-PGMP n=43 procedures	Usual Care n=14 procedures
Mean post-op CBG, mg/dL (4SD)		
Type 1 DM	173.8 (74.7)	217.8 (53.2)
Type 2 DM	181.9 (54.2)	194.8 (28.4)
All	175.6 (66.8)	205.7 (48.9)
Post-op CBG M200, n (%)		
Type 1 DM	15 (57.7)	3 (33.3)
Type 2 DM	11 (68.8)	2 (50.0)
All	27 (62.8)	6 (42.8)
Pump Incident(s)*, n (%)	1 (1.7)	0

*One incident was documented as an accidental pump discontinuation during surgery.

Two hypoglycemic events occurred on admission to SDS and were unrelated to the CSII-PGMP. There were no documented episodes of intra- or postoperative hypoglycemia. There was one documented pump incident in which CSII was unintentionally dislodged during surgery. This patient received subcutaneous insulin injections, and CSII was resumed postoperatively. There were no recorded incidences of pump malfunction and no pump alarms occurred during the perioperative time period.

Subgroup analyses on the 43 surgical procedures done using the CSII-PGMP showed no difference in the proportion of patients with a postoperative CBG ≤200mg/dL when examined according to type of diabetes, anesthesia used (general vs. regional), admission CBG, or perioperative use of steroids. More patients with anticipated surgical length ≤120 minutes had a postoperative CBG ≤200mg/dL compared to those with longer procedures (p=0.03), despite similar admission CBG (176.4 ± 68.2 vs. 191.2 ± 71.9 mg/dL, p = 0.52). Patients undergoing short procedures also had lower postoperative CBG (158.1 ± 53.9 vs. 216 ± 77.7 mg/dL, p < 0.01).

Our QI project demonstrates the safety and efficacy of a standardized CSII-PGMP in patients with diabetes who are admitted to a SDS unit for elective surgeries ≤120 minutes in length. Protocol safety was defined by the absence of hypoglycemia and the low frequency of pump events (n=1). The majority of patients who were managed according to the CSII-PGMP had a post-op glucose <200 mg/dL.

There is a need for standardization of approaches for use of CSII therapy in patients with DM who present for elective surgery since their glycemic management is often more complex than with other insulin regimens. A CSII PGMP can help reduce therapeutic misadventures by clinical personnel not familiar with CSII therapy, as well as guide goal-directed glycemic and surgical outcomes.[12] It is important to recognize that the success of this protocol intervention was due largely to the participation of anesthesiology and SDS personnel. As with any protocol guiding glycemic management, ongoing communication with the services where this will be used is essential. However, further studies that prospectively assess CSII-surgical protocols with specific glycemic targets directed at improved perioperative BG control are needed.

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Obesity Treatment at UPMC

We have all heard the statistics of the increasing rates of obesity with associated increasing costs to the health care system and employers. Despite recognition of obesity as a disease by the American Medical Association in 2013, questions remain regarding effective treatments that are both acceptable and affordable to patients who are seeking to achieve and maintain weight loss. Below is information regarding a new program in the UPMC Center for Diabetes and Endocrinology (CDE) that provides access to, and information about, available obesity treatments.

David Rometo, MD, a clinical assistant professor of medicine in the Division of Endocrinology and Metabolism since 2011, is a member of The Obesity Society and a Diplomate of the American Board of Obesity Medicine, as well as in Endocrinology and Metabolism. He attends international as well as local multidisciplinary meetings on the subject of obesity in order to stay up to date with advances in obesity management. He also works with other faculty members involved in the bariatric surgery program available at Magee-Womens Hospital of UPMC.

Following publication of guidelines for obesity treatment by the Obesity Society, American College of Cardiology, and American Heart Association, Dr. Rometo concluded that despite the tremendous amount of research being conducted in obesity medicine at UPMC and elsewhere, many overweight and obese patients seen in the UPMC CDE did not have access to the evidence-based care recommended by these organizations. In addition, of the patients who would qualify for and benefit from bariatric surgical procedures, many either would not or could not pursue the treatment. Among patients who have already undergone bariatric surgery, some still wish to achieve additional weight loss or avoid regaining weight already lost. To achieve this, some patients pursue a variety of recommended diets, attend a commercial weight loss program in the community, or take weight loss medication often without receiving adequate medical supervision.

Dr. Rometo recognized this gap in patient care, and in August 2014 decided to address this by establishing a medically-supervised weight loss program that meets evidence-based guidelines for significant and long-lasting weight loss in the UPMC Center for Diabetes and Endocrinology within the Falk Clinic. Available programs to facilitate weight loss include a meal replacement program (OPTIFAST), and for some selected patients, very low calorie diets (600-800 kcal/day). Some patients enrolled in this program have either reduced or stopped medications used to treat their diabetes or elevated blood pressure. Others report reductions in pain attributed to arthritis, restoration of regular menstrual cycles (in women), and increased energy.

The keys to success of any weight loss program are an individual's commitment to losing as much excess weight as safely as possible while learning and practicing the behaviors that will maintain weight loss for the long-term. Weight loss is difficult for many people, and weight maintenance even more so. Patients are made aware of the fact that their lifestyle and dietary habits after six months in a weight loss program need to be very different from those preceding their participation to avoid regaining any lost pounds. It is important to avoid unreasonable expectations which alone can be a deterrent to successful weight loss. Factors that contribute to success include daily self-monitoring of weight using an accurate scale, monitoring of calorie intake including measuring and recording foods consumed, engaging in aerobic exercise or activities such as walking, and using a pedometer or activity monitor to record the number of steps achieved each day.

Additional staff involved in the weight loss program in the UPMC CDE include Carley Stoy, PA-C, and Mehry Safaeian, RD, CDE. Patients attend behavior intervention and lifestyle classes with the registered dietitian every other week for six months at Falk Clinic. They obtain their OPTIFAST products from the Falk Pharmacy. Patients are seen by a physician or physician assistant on a monthly basis for medical monitoring and adjustments to their diet or medications. Following this initial six month program, patients have monthly contact with medical personnel, and are seen for an office visit every three months to ensure that their weight loss is being maintained. Weight loss medications may be prescribed to selected patients to facilitate weight loss. The costs of this program are at least $75 per week for OPTIFAST products during the meal replacement phase of the diet, and $400 for the entire six month behavior/lifestyle class program with associated medical monitoring. Weight loss medications have costs that vary by insurance program and are usually associated with additional costs. The savings of this weight loss program include lower costs for foods previously used to meet caloric requirements prior to the use of OPTIFAST products, reductions in diabetes and blood pressure medications for some patients, and anticipated reductions in health care costs related to disorders associated with obesity, such as sleep apnea.

This program has been accepted by members of the endocrine faculty and other providers. Dr. Rometo seeks to expand the program by offering training to interested physicians, and advanced care providers, in the UPMC Division of Endocrinology and Metabolism. The additional trained clinicians will allow an increased number of patients in the region to be served by the program.

Improving Patient Outcomes Through Technology

The Diabetes Center at UPMC Mercy offers comprehensive diabetes management services, including inter-disciplinary team-based endocrinologist care with an emphasis on a self-management education program provided by a certified diabetes educator and dietitian.

Members of the care team serving the UPMC Mercy community recently received an Innovation Award from The Beckwith Institute. The project entitled *Access to Diabetes Technology and its Effect on Glycemic Control and Self-Management Behaviors* is designed to help people with diabetes in an underserved urban community improve clinical and behavioral outcomes.

Patients experiencing glucose variability and who are at high risk for diabetes complications will be introduced to continuous glucose monitor (CGM) technology. They will work with an endocrinologist who will review blood glucose patterns to identify problem areas and a diabetes educator to learn how to interpret and respond to monitoring results. This project assists those in the local community identify root causes for glucose variation and provides individuals with uncontrolled diabetes exposure to innovative diabetes technology and self-management education.

Detecting problems related to unpredictable blood glucose patterns through advanced technology offers an opportunity to provide a valuable service to individuals often unable to reap the benefits of innovative technologies. This project affords the opportunity to reduce disparities related to diabetes care among minorities and underserved populations in the Pittsburgh region by providing access to advanced technology combined with guidance and education from a multidisciplinary care team.

Division of Endocrinology Welcomes New Researcher

Michael J. Jurczak, PhD, recently joined the Division of Endocrinology and Metabolism at the University of Pittsburgh as an assistant professor and member of the newly formed Center for Metabolism and Mitochondrial Medicine (C3M). Dr. Jurczak received his BS in Physiological Science from UCLA and his PhD in Molecular Metabolism and Nutrition from the University of Chicago. He continued his training as a postdoctoral fellow with the Howard Hughes Medical Institute at Yale University in the laboratory of Dr. Gerald Shulman, where he specialized in performing isotopic infusion studies in transgenic mice to assess glucose homeostasis and insulin action while investigating the pathogenesis of insulin resistance and type 2 diabetes. Prior to arriving at the University of Pittsburgh, Dr. Jurczak was an Instructor in Medicine at Yale University, where he divided his time between his own research program and serving as co-director of the NIH-funded In Vivo Metabolism Core of the Yale Mouse Metabolic Phenotyping Center (MMPC).

Dr. Jurczak's lab is primarily interested in the relationship between nutrient excess and mitochondrial overload, and the pathogenesis of metabolic diseases, such as fatty liver disease, insulin resistance, and type 2 diabetes. Mitochondrial dysfunction and ectopic lipid accumulation in the liver are both associated with insulin resistance in human subjects, but the cause and effect nature of these associations remains unclear. Dr. Jurczak's lab is specifically interested in a mitochondrial repair mechanism, called mitophagy, that regulates the selective removal of damaged mitochondria via the autophagosomal pathway. Because autophagy is suppressed in mouse models of obesity and fatty liver disease, it is likely that mitophagy is similarly impaired and may contribute to the decline in mitochondrial function seen in human patients. Interestingly, a key component of the mitophagy pathway, an ubiquitin E3 ligase called Parkin, is upregulated in livers of obese mice. This change may represent a compensatory response to remove damaged mitochondria from hepatocytes or result directly from the loss of autophagy.

Dr. Jurczak's group is using a genetic approach to test whether the loss of Parkin-mediated mitophagy in liver predisposes mice to mitochondrial dysfunction, ectopic lipid accumulation, and insulin resistance. Dr. Jurczak's work is supported by a K01 from the NIDDK, as well as funds from the NIH/NIDDK MMPC Consortium MICROMouse Program and the University of Pittsburgh C3M.

UPMC LIFE CHANGING MEDICINE

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Division of Endocrinology and Metabolism

Clinical Treatment Areas:

- Diabetes
- Obesity
- Osteoporosis
- Pituitary, Adrenal, and Reproductive Hormonal Disorders
- Thyroid Disorders

Research Areas of Focus:

- Arterial Smooth Muscle in Health and Disease
- Insulin Resistance
- Obesity
- Pancreatic Beta Cell Function
- Thyroid Cancer Molecular Diagnosis
- Type 1 and Type 2 Diabetes
- Community-based and Primary Care Programs
- Self-management and Lifestyle Interventions

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