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Jennifer Shine Dyer, MD, MPH
It is often said that “the language of millennials is digital.” It’s not surprising that this generation raised by technology would prefer a kiosk type of digital, customizable consumer experience in health care. Therefore, the use of a diabetes kiosk for medical devices within our pediatric endocrinology office has been successful.

4 ISSUES RELATED TO SHIFT WORK IN PEOPLE WITH DIABETES
Daniel Lorber, MD, FACP, CDE
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Yoga in the Clinic
This edition of Educator’s Corner defines and describes yoga and its common components, evaluates the scientific evidence of yoga as an adjunctive treatment modality for diabetes, and provides “practice pearls” for implementing yoga in the clinic and/or in diabetes self-management curricula and programs.
I would like to take this opportunity to welcome you to our first issue of Practical Diabetology for 2018 and introduce you to our updated design. Many of you know that I have recently moved to The Ohio State University Wexner Medical Center, where my primary role is to develop an adult type 1 diabetes program, along with performing clinical research, teaching and seeing patients. However, the goal of Practical Diabetology remains unchanged: to provide busy health-care professionals with straightforward, practical information to enhance the care and treatment they provide to their diabetes patients. Our articles concern all aspects of diabetes and its complications and are designed to be quickly read, easily understood and readily incorporated into daily practice.

This issue is very exciting as we are addressing some very practical issues in diabetes management, including empowering patients by teaching them to download their devices in the clinic, considering stress and shift work as modifiable factors contributing to hyperglycemia, and utilizing yoga to decrease stress and improve metabolic biomarkers.

As you’ll see, our new design introduces photos of our contributors. We encourage you to approach those you see at conferences and other events. Not only do authors enjoy hearing your feedback on their articles, they also look forward to discussing any questions that you may have.

The “Journal Watch” feature provides the NCT number, references and a brief summary of either landmark trials or emerging therapies. We are expanding the photos and figures with each article to include more material for the reader to use in teaching patients as well as colleagues about the respective topic.

In future issues, we will be featuring the section “2 Minutes with Diabetes.” I encourage all readers to submit topics or questions, which will then be sent for review to be published in the print issues. Please use “Practical Diabetology” in the subject line and send to kittlewyne@hotmail.com.

Editor
Kathleen Wyne

EDITORIAL NOTE

If there’s one thing you can say about interactive kiosks, it’s that they are impossible to ignore, even in the outpatient endocrinology office. This technology has been front and center at some of the largest and most innovative diabetes centers, hotel and transportation businesses for quite some time. Less known, however, is the reason for their recent proliferation in medicine and diabetes.

Currently, there is a lot of conversation about the rise of the “consumer”—a newly empowered stakeholder in our country’s health-care system. It’s time, then, to consider how kiosks can be used to enhance that consumer experience in health care.

The birth of interactive kiosks

The first self-service interactive kiosk was developed in 1977 at the University of Illinois at Urbana-Champaign by premed student Murray Lappe. The content was created on the PLATO computer system and was accessible by plasma touch screens. The first plasma display panel was also invented at the University of Illinois at Urbana-Champaign, by Donald Bitter. Lappe’s kiosk, called The Plato Hotline, allowed students and visitors to find movies, maps, directories, bus schedules, extracurricular activities and courses. When it debuted in the University of Illinois student union in 1977, more than 30,000 students and visitors stood in line during its first six weeks to try their hand at a “personal computer” for the first time. The first successful network of interactive kiosks used for commercial purposes was developed by the Florsheim Shoe Company in 1983. The network of more than 600 kiosks provided images and video promotion for customers who wished to purchase shoes that were not available in the retail location. Style, size and color could be selected, and the product paid for on the kiosk itself. The transaction itself was sent to the Florsheim mainframe in St. Louis, Missouri, via dial-up lines for next-day delivery. This kiosk network operated for six years in Florsheim retail locations.

In 1991, the first commercial kiosk with Internet connection was displayed at the Comdex computer expo to locate missing children.

Kiosks today

Kiosks now combine the classic vending machine with high-tech communications and complex robotic and mechanical internals. Such interactive kiosks can include self-checkout lanes, e-ticketing, hospital check-ins, medical device downloads and viewing, and vending. Interactive kiosks have become a larger part of the retail and medical landscape as customers embrace technology in their daily lives.

It’s often said that “the language of the millenium is digital.” It’s not surprising that this generation raised by technology would prefer a kiosk type of digital, customizable consumer experience in health care. Therefore, the use of a diabetes kiosk for medical devices within our pediatric endocrinology office in Columbus, Ohio, has been successful.

Pediatic endocrinology office kiosk case example

Patients begin their appointment experience by sitting down at a public computer, or kiosk. They are greeted by a friendly medical assistant and a set of instructions detailing which software programs they will utilize next at the kiosk desktop. The software program is designed by each patient’s glucose meter, insulin pump or continuous glucose monitoring device. Current diabetes device software programs used on the kiosk include Diasend, Glocoo, Carelink and Dexcom.

The patient then uses the designated device connection cord provided by the medical device company to access the kiosk and software. The cords hang next to the kiosk and are a visible reminder of the lack of interoperability between medical devices.

Once the devices are connected to the software programs, the patient’s device data from the past two weeks are downloaded and printed out by a printer at the kiosk station so that the data can be quantified and visualized. Total daily insulin doses, number of daily boluses, average blood

RESOURCES
Patient kiosk at Central Ohio Pediatric Endocrinology and Diabetes Services

**Patient engagement**

Engagement, non-hurried and enabled by interactive kiosk software, is the medical experience all people desire. As noted, sharing a complete quantified diabetes experience aided by the kiosk with the patients themselves and their care team allows for empowerment. The empowerment is often directly related to finding actionable data patterns that relate to each patient’s current diabetes experience. Sometimes the patient or family cannot find that pattern unless the provider points it out during the clinic visit. However, once that pattern is revealed, it is more likely that a patient can understand what behaviors will help to change that pattern. Nonetheless, behavior change can only happen when a patient is ready.

**Patient support**

Encouraging families to download data from their child’s medical devices on a weekly basis has allowed parents to reduce the burden of diabetes on their children by helping directly with pattern management and problem-solving. This has been especially true for our teenage patients, who often operate their devices independently of their parents. However, teens can easily become overwhelmed, which leads to compensatory behaviors such as lying about blood sugars to their parents and ignoring their diabetes all together. Weekly downloads allow parents to be more informed about their teen’s diabetes habits and offer support early and often when a problem first develops.

**Communication**

Kiosk downloads have allowed for streamlined communication between visits when families need extra assistance in pattern management, a core principle for successful diabetes management. When the provider is able to review the data within the full picture of total daily insulin dosing as well as past and present continuous glucose trends, a precise dosing recommendation can be made. Furthermore, discussion of the data visualization and the diabetes experience can be used to teach the principles of pattern management to better empower each patient and their families between visits. Communication about device settings (which is noted in the kiosk downloads) has been very helpful for families that have children with multiple caregivers: daycare, school nurses, teachers, coaches, babysitters, grandparents. Families are able to access the data easily from home to share with these caregivers. The consistent data presentation of device settings from the downloads has allowed each of these stakeholders to clearly see how each device should be set, thereby minimizing dosing errors while the child is in their care.

**Office visit efficiency**

Having patients download their own data at the office kiosk has also improved operational efficiencies within the office. Prior to the kiosk, the downloading process by the medical assistants was slowed by the need to perform multiple tasks by one person: vitals, urine checks, in-office A1C checks, device downloads. Having a patient and/or their family member download the device’s data allows the medical assistant to measure the patient’s A1C and check vitals while someone else downloads the information. Furthermore, when there is a line to check into the office, a patient can begin the downloading process at the kiosk, thereby better utilizing the wait time. The downloading time was a bit slower while patients and families initially learned the kiosk process, but after only one or two more visits, patients and families were able to quickly access their data and subsequently were escorted into the exam room. This improved efficiency has allowed for more time to be spent with the provider than on administrative tasks during each office visit.

In conclusion, kiosks have become a tool for patient empowerment, engagement, communication and efficiency within the pediatric endocrinology office. Despite the fact that technology can often be impersonal, kiosks can aid in personalization for the diabetes consumer...and just make life with diabetes a little bit easier and quicker.

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ISSUES RELATED TO SHIFT WORK IN PEOPLE WITH DIABETES

Chronobiology and the effects of circadian rhythms have been important foci of endocrinology research for well over 100 years. It is only with the development of new insulins, sophisticated glucose monitoring techniques and hormone immunoassays that it became apparent that circadian rhythms of GH (growth hormone) and cortisol exert a major impact on glucose metabolism, leading to the discovery of the “dawn phenomenon” and its hormonal mechanisms. The concurrent move toward greater glycemic control, culminating in the Diabetes Control and Complications Trial (DCCT) results, led to greater understanding of the dawn phenomenon and development of new pharmacologic and technical approaches to improve morning glycemic control without causing significant increased risk of nocturnal hypoglycemia.

Variations in sleep patterns cause significant changes in counter-regulatory hormone rhythms, leading to changes in insulin requirements. These changes are particularly relevant for people who are employed in careers requiring shift work. Changes from day to evening or night work. Extensive literature shows that shift work increases insulin resistance, the risk of Type 2 diabetes and related metabolic abnormalities of the metabolic syndrome. A British study of 4,000 randomly selected individuals with diabetes found that shift workers with diabetes complained of higher rates of headache and tiredness. As more insulin-treated people (both Type 1 and Type 2) enter the work force, this issue has become a significant concern for occupational medicine physicians. A recent email to the ADA Legal List (Diabetes and its complications should be considered a significant concern for occupational medicine physicians. A recent email to the ADA Legal List (shift work and insulin-dependent diabetes) that asked for advice on diabetes management in workers whose jobs required shift work. The replies were collated and edited. Here they are.

GOOD AFTERNOON: I am posting a question on behalf of an occupational medicine physician for your consideration. “Does anyone have guidance or resources on shift work assignments in patients with insulin-dependent diabetes? It has always been my practice to advise against rapidly changing shift work for these patients, but some of our facilities want more guidance than this. Is there a generally recommended period of time between shift changes that anyone would advise, in the interests of the patient adjusting eating schedules and insulin doses in order to maintain control of insulin-dependent diabetes? What has been your practice for such patients? Is there any guidance out there on this subject (shift work and insulin-dependent diabetes) that I can reference?”

SHIFT WORK: SUMMARY OF RESPONSES PHYSIOLOGY

“This issue is complicated by another factor that is gaining more widespread attention among chronobiologists—the role of ‘social jetlag.’ Social jetlag represents the mismatch between your own biological clock’s timing (i.e., whether you are an ‘owl’ or a ‘lark’) and your social clock (i.e., whether you work a night shift, day shift or variable shift). In fact, a very recent Dutch study demonstrated that those with a median age <61 and a circadian misalignment of more than two hours had a nearly twofold greater risk of metabolic syndrome, Type 2 diabetes or prediabetes. This study just adds to the body of literature demonstrating the negative effects of circadian misalignment.”

MULTIPLE INJECTION THERAPY

• “If you change your shift at home, I would advise your patient to adjust their insulin dosage to their new schedule.”
• “I have found that switching to Tresiba as the basal insulin works great for shift workers since it does not have to be taken at the same time every day. Meal time is not as concerning and no changes usually need to be made.”

INSULIN PUMPS

• “As a certified pump trainer for over 17 years, I find the alternate basal pattern an awesome feature. Taken work and time to decipher needs but has been great. Used with everyone from a nuclear power plant employee to medical personnel. The person has to be paying attention to flip the pattern but it can work nicely.”
• “As a RD CDE for over 35 years in the South with mill workers, I have had success with setting their rest basal rates and working basal rates to be the focus. So what they would run at night, I have them run when they are asleep. Also agree with the person who had them eat consistent carb and protein every 4-5 hours when they are asleep. Also agree with the person who had them eat consistent carb and protein every 4-5 hours when they are asleep.”
• “My insulin pump basal amount is set specifically for the requirement of my basal needs. So, in other
The biggest change to accommodate shift work is work. Certainly if I chose to do this, at least in derived over time. Consequently, analyzing patients that I have that do the best are the ones that keep their days and nights on the same schedule. This is very challenging because of hormone release that affects appetite, stress, etc. Most of my patients struggle but I encourage them to pack the same foods for a night shift as they would for a day shift and attempt to eat at intervals similar to the day shift. As I said, it is quite challenging, but the patients that can do this do very well.

LEGAL CASE
Many years ago, I represented a USPS worker with Type 1. He was assigned to rotating shifts, but was requesting a single daytime shift to control his blood sugars. His treating physician supported his request, but an examining physician did not. Unfortunately, there were two other physicians who had examined him as a part of a worker’s compensation claim who also did not support his request. They were not experts in his ADA case, but their reports were allowed to cross the treating physician who admitted, when confronted with the two reports, that if my client was really strict and observant in testing and eating, he could probably work rotating shifts. Also undisclosed until days before trial were surveillance videos of the U.S. attorney truthfully said he knew of none, but just before trial, the worker’s comp gave him the films, and the judge let them in). Those films showed him doing yard work and loading cardboard boxes into his pickup truck. Although I got past days before trial were surveillance films (the U.S. exposure to sunlight is the most important stimulus to develop and maintain the body’s clock. The SCN (suprachiasmatic nucleus of the hypothalamus, where it receives information from specialized ganglion cells in the retina, synchronizing the body’s clock to the solar day. In fact, exposure to sunlight is the most important stimulus to establish the circadian rhythms that control stability of proteins necessary to establish the 24-hour clock and maintain the ongoing process of the circadian system. The SCN is composed of several “clock genes” and proteins (PAS) proteins that form the CLOCK-BMAL1 activator complexes and initiate transcription of target genes by binding to specific DNA sequences (E-boxes) in their promoter regions. These target genes include Period (Per) 1-3 and Cryptochrome (Cry) 1/2, which make up the negative limit of the feedback loop. PER and CRY proteins form heterodimers and inhibit many other clock genes by using circadian rhythms to control the expression of LRRC8A, which is present in the SCN, that limits the output of circadian clock genes to the SCN and prevents activation of the circadian clock.

Controlling circadian rhythms
In mammals, the circadian system is organized as a multilevel oscillator network. The pacemaker (or master clock) is located in the suprachiasmatic nucleus (SCN) of the hypothalamus, where it receives information from specialized ganglion cells in the retina. The SCN is the primary oscillator in the body, regulating the timing of various physiological processes, such as sleep-wake cycle, circadian rhythms, and metabolism. The SCN is influenced by environmental factors, such as light and darkness, and by internal factors, such as hormones and other signaling molecules. The SCN communicates with other parts of the brain and body to synchronize the body’s internal clock with the external environment.

SUMMARY
As one can see, there are a number of approaches to this common problem. If you have a different solution, please feel free to send it to me the American Diabetes Association Legal Advocacy listserve (HCPLEGALADVOCACY@LIST.DIABETES.ORG). Even better—join us in fighting for fair employment for people with diabetes by going to www.diabetes.org/patientsrights and signing up.

Commentary
Chronobiology and Type 2 Diabetes Mellitus
When patients tell us that they think the stress of their job or lifestyle caused their diabetes, we often talk to them about how they could make their life-style more stress-free in regards to discuss the effect stress can exert on cortisol regulation, which could contribute to diabetes but certainly does not cause it. But how often do we consider the causal role circadian rhythms play in the development of hyperglycemia? Examples of environmental influences that alter circadian rhythms include shift work—especially rotating shifts—and inadequate sleep, which are common risk factors for diabetes.

When people think of circadian rhythms, they don’t typically think of the molecular mechanisms that underlie these patterns. Circadian clocks are ancient programming that has been conserved in most organisms. They represent a complex time-keeping mechanism that is controlled both at the level of gene transcription and protein translation to coordinate body processes throughout the ambient 24-hour light/dark cycle. While the circadian pattern of regulation of these genes is set by the Earth’s 24-hour cycle, there is some modulation of these by certain environmental cues such as exposure to light, temperature and food intake, thereby allowing adaptation to schedules other than the classic 9-to-5 schedule.

Controlling circadian rhythms
In humans, the circadian rhythm system is organized as a multilevel oscillator network. The pacemaker (or master clock) is located in the suprachiasmatic nucleus (SCN) of the hypothalamus, where it receives information from specialized ganglion cells in the retina, synchronizing the body’s clock to the solar day. In fact, exposure to sunlight is the most important stimulus to develop and maintain the body’s clock. The SCN is the primary oscillator in the body, regulating the timing of various physiological processes, such as sleep-wake cycle, circadian rhythms, and metabolism. The SCN is influenced by environmental factors, such as light and darkness, and by internal factors, such as hormones and other signaling molecules. The SCN communicates with other parts of the brain and body to synchronize the body’s internal clock with the external environment.

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loss of beta-cells through apoptosis can be increased by prolonged exposure to high glucose levels and/or high free fatty acid levels, which activate endoplasmic reticulum, oxidative and inflammatory stress pathways, leading to cell death. Loss of beta-cell insulin secre- tory ability is also multifactorial, including changes in glucose transport, glucose oxidation, increase in reactive oxygen species (ROS), leading to mitochondrial dysfunction and impaired exocytosis. Appropriate circadian activation of the feedback loops controlled by the CLOCK and BMAL1 genes could help maintain the balance of oxidative stress and mitochondrial function in the beta-cell, thereby maintaining beta-cell mass through controlled apoptosis and appropriate insulin secretion. In fact, animal studies of genes identi- fied as playing a role in controlling this feedback loop have shown that targeted disruption of the beta-cell molecular clock, depending on the specific gene, can lead to abnormalities at all levels of glucose sensing, insulin secretion and maintenance of beta-cell mass. These data suggest that any disruption of the circadian clock could lead to hyperglycemia and Type 2 diabetes. Control of the beta-cell molecular clock is not only internal but also external through stimuli such as cortisol and leptin. These hormones are known to have very specific circadian patterns, including controlling the morning rise in glucose prior to awakening for the day. Studies have shown that disruption of the light-dark cycle, whether in the experimental setting with animal models or through shift work, travel or loss of sleep, causes alteration in levels of cortisol. Similarly, stress can lead to sustained increases in cortisol. Taken together, disruption of the circadian patterns for these hormones could play a role in altered beta-cell func- tion, leading to sustained hyperglycemia.

Alteration of circadian rhythm in Type 2 diabetes Epidemiologic surveys of workers in a variety of professions have shown that rotational shift work is associated with an increased incidence of Type 2 dia- betes. Rotational shift-work jobs entail shift changes every few days, such as from day shift to afternoon shift to night shift and then several days off before the cycle starts over. Additionally, changes in sleep patterns or decreased sleep have been associated with an increase in Type 2 diabetes. Studies in humans have shown that acute loss of sleep can impact glucose homeostasis in as little as one to three weeks. What is not definitively known is whether these findings are true for diabetes at risk for Type 2 diabetes, as observed in the animal studies, or if the changes in glucose also occur in those with no family history of Type 2 diabetes. Despite large GWAS studies, the gene(s) responsible for Type 2 diabetes remains largely unknown. With regard to the role of the circadian clock in maintenance of beta-cell health, one must consider that subtle mutations in one or more of the clock-regulated genes could lead to a predisposition to Type 2 diabetes that is then exacerbated by a fluctuating dark-light cycle.

Summary Molecular studies have identified genes that are crucial for maintaining circadian rhythms. Targeted disruption of some of these genes has led to Type 2 diabetes in animal studies. Lactate, a liver factor, as well as factors such as shift work and high levels of stress lead to alterations in circadian rhythms and may disrupt the molecular clock mechanisms, resulting in permanent alter- ations of pancreatic beta-cell function. The clinical implication of tying together these pieces of information is that the patients are probably right when they say that stress caused their diabetes—or at least partially right, because the stress, whether physical or emotional, probably altered the patterns of their circadian clock, thereby bringing on their diabetes at a younger age than would have been expected from their genetic predisposition.

SELECTED REFERENCES

The Meter of Metabolism.
Thiazolidinediones or Sulphonylureas and Cardiovascular Accidents Intervention Trial

Study Title Acronym: TOSCA.IT
ClinicalTrials.gov Identifier: NCT00700856

References (related):

Study Design: Randomized parallel assignment of pioglitazone versus placebo

Primary Outcome Measure: A 1% level lower than 7.0% at week 24, with no episodes of severe hypoglycemia or diabetic ketoacidosis after randomization

Results: The primary endpoint was achieved by fewer patients in the pioglitazone group than in the sulfonylureas group (148 [10%] vs. 208 [14%], p<0.001). Moderate weight gain (less than 2 kg, on average) occurred in both groups. Rates of heart failure, bladder cancer and fractures were not significantly different between treatment groups.

Summary: Unfortunately, the study was stopped early for futility. Therefore, it is not able to prove CV safety of SUs. The futility may be related to the fact that event rates were very low and lower than what has typically been seen in recent CVOTs. However, it does provide safety data regarding both pioglitazone and SU with respect to CV events, rates of heart failure and TZD-specific events such as fractures and bladder cancer. Although there was no CV benefit, the safety data suggest that both pioglitazone and SUs should still be considered as part of combination therapy for glucose control.

Results: TOSCA IT was a multicenter, randomized, pragmatic clinical trial in which patients ages 50 to 75 years with Type 2 diabetes inadequately controlled with metformin monotherapy (2–3 g per day) were recruited from 57 diabetes clinics in Italy. Patients were randomly assigned (1:1) by permuted blocks randomization, stratified by site and previous CV events, to add on pioglitazone (15–45 mg) or a sulfonylurea (5–15 mg glibenclamide, 2–6 mg gliclazide or 30–120 mg glimepiride, in accordance with local practice). The trial was unblinded, but event adjudicators were unaware of treatment assignment.

In all, 3,028 patients were randomly assigned, with 1,535 assigned to pioglitazone and 1,493 to the sulfonylureas group (hazard ratio 0·96, 95% CI 0·74–1·26, p=0·79).

Fewer patients had hypoglycemia in the pioglitazone group than in the sulfonylureas group (148 [10%] vs. 208 [14%], p=0·001). Moderate weight gain (less than 2 kg, on average) occurred in both groups. Rates of heart failure, bladder cancer and fractures were not significantly different between treatment groups.

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Results: Exenatide Study of Cardiovascular Event Lowering

Study Title Acronym: EXSCEL
ClinicalTrials.gov Identifier: NCT01144338

References (related):

Sponsor: Amylin Pharmaceuticals; AstraZeneca

Study Design: Randomized parallel assignment of 14752 participants allocated to exenatide once weekly or placebo

Primary Outcome Measure: Composite of cardiovascular death, nonfatal MI or nonfatal stroke

Results: After a median of 3.2 years, 839 of 7,356 patients (11.4%, 3.7 events per 100 person-years) in the exenatide group and 905 of 7,396 patients (12.2%, 4.0 events per 100 person-years) in the placebo group developed either CV death, nonfatal MI or nonfatal stroke (hazard ratio, 0.91; 95% confidence interval [CI], 0.83 to 1.00).

Exenatide Study of Cardiovascular Event Lowering

Study Title Acronym: EXSCEL
Summary: Unlike the liraglutide CVOT, this trial involving a different GLP-1 RA did not find a CV benefit for weekly exenatide. However, it is reassuring that there was no increase in hospitalization for heart failure, no increase in serious adverse events and no increase in myocardial infarction. Therefore, this remains a valuable agent for glucose lowering, but does not have any additional nonglycemic benefits.

Evolocumab significantly reduced CV outcomes consistently in patients with and without diabetes at baseline. For the primary composite endpoint, the hazard ratios (HRs) were 0.83 (95% CI 0.75–0.93; p=0.008) for patients with diabetes and 0.87 (0.79–0.96; p=0.0052) for patients without diabetes.

Summary: There was a small difference in pregnant women using CGM (mean difference -0.19%; 95% CI -0.34 to -0.03; p=0.0207). Pregnant CGM users spent more time in target (68% vs. 61%; p=0.0004) and less time hyperglycemic (27% vs. 32%; p=0.0279) than did pregnant control participants, with comparable severe hypoglycemia episodes (18 CGM and 21 control) and time spent hypoglycemic (45% vs. 45%; p=0.63). Neonatal health outcomes were significantly improved, with lower incidence of small for gestational age (4% vs. 17%; p=0.0157), fewer incidences of neonatal hypoglycemia (4% vs. 8%; p=0.0020), and one-day shorter length of hospital stay (p=0.0091). The primary outcome did not demonstrate an apparent benefit of CGM in women planning pregnancy.

Summary: This study shows that use of CGM can increase time in range and decreases hyperglycemia. Interestingly, there was no decrease in hypoglycemia, although the time below range was very low at 3–4%. Based on these data, one could argue that use of CGM should now be standard of care for all pregnant women who have Type 1 diabetes. It is interesting that the group planning for pregnancy did not show a benefit when using CGM. It would be of interest to compare these women to age-matched controls who are not planning for pregnancy to see if their overall control was better than one would expect for their age.

References (related):
Educator’s Corner

Yoga in the clinic

This edition of “Educator’s Corner” defines and describes yoga and its common components, evaluates the scientific evidence of yoga as an adjunctive treatment modality for diabetes, and provides “practice pearls” for implementing yoga in the clinic and/or in diabetes self-management curriculum and programs.

The science of yoga is rooted in traditional Indian medicine. Ancient texts vividly describe clinical features and complications of what modern medicine labels as Type 1 diabetes and Type 2 diabetes. In Ayurveda, a component of the traditional Indian medical system, the Sanskrit word for diabetes mellitus is “madhumeha,” which translates as “sweet urine.” In these ancient texts, treatment of madhumeha was based on the associated clinical features (i.e., body anthropometrics—thin versus overweight) and typically included meditation (dhyana) and mantra (dharana), breathing exercises (pranayama), dietary regimens (i.e., herbs and spices, various combinations of dietary protein and fat) and physical movement—yoga postures (asanas). This ancient or Eastern approach in many ways parallels current allopathic or Western evidenced-based practice of lifestyle modification to include an individualized nutrition prescription, stress management, relaxation response training and positive coping skills, and purposeful movement with a reduction in sedentary behaviors. The latter can be accomplished in a “two-for-one” yoga. Is there evidence that yoga, a mindful—coordination of breath with movement, facilitates improvements in biomarkers (glycemic control, hemodynamic response, metabolic indices, and psychosocial parameter) of diabetes health?

Over the last decade or so, there has been an increase in the number of scientific publications as well as lay articles on the behavioral and biomedical benefits of yoga on various chronic-lifestyle diseases such as cardiovascular disease, anxiety, depression, post-traumatic stress disorder, obesity, chronic pain, and diabetes. Despite methodological issues (i.e., limited sample size, lack of blinding and randomization in some studies, sparse analytics in others, heterogeneity, clinical versus statistical significance, and lack of comparators), the preponderance of data nonetheless indicates improved physiological and psychological benefits of yoga in those with diabetes, most notably those with Type 2 diabetes.

Evidence of yoga’s benefits

A pilot study comparing a yoga intervention with a walking control group reported a significant decrease in weight, BMI and waist circumference compared to the walking group. Reductions in fasting blood sugar (FBS), postprandial blood glucose (PPBG), serum insulin, insulin resistance, blood pressure or cholesterol were not observed. The researchers also noted statistically significant improvements in measures of psychological well-being in both groups. Interestingly, noted improvements in mood and positive affect, which were greater in the yoga group, are of clinical and empirical interest. One large randomized controlled trial found that increasing positive affect significantly improved physical activity maintenance at one year. This suggests a potential positive behavior change advantage for the yoga group versus the walking group. In a randomized parallel study of a three-month yoga intervention in individuals with Type 2 diabetes, researchers observed significant reductions in total cholesterol (TC), LDL cholesterol (LDL-c) and triglycerides (TG) with a nonsignificant elevation in HDL cholesterol (HDL-c) in the yoga group versus the control group. The yoga group also had a nonsignificant reduction in BMI and a significant reduction in both weight and waist-to-hip ratio. Interestingly and unfortunately, the control group did not fare so well, showing significant increases in body weight, nonsignificant increases in BMI, TC, LDL-c and TG, and a corresponding decrease in HDL-c.

Though yoga itself is considered a type of mindfulness in many cultures, a recent study compared standard care plus yoga asana combined with mindfulness eating on glycemic parameters in women with gestational diabetes. The results revealed statistically significant (p<0.05) improvements in FBS, PPBG and HbA1c in the intervention group (standard care plus yoga asana and mindfulness eating) versus the control group (standard care alone).

Mixed results

A more recent paper also evaluated a dual intervention of yoga and peer support on glycemic control, pharmacological adherence and anthropometric changes in Type 2 diabetes. A pilot study comparing a yoga intervention with a walking control group reported a significant decrease in weight, BMI and waist circumference compared to the walking group. Reductions in fasting blood sugar (FBS), postprandial blood glucose (PPBG), serum insulin, insulin resistance, blood pressure or cholesterol were not observed. The researchers also noted statistically significant improvements in measures of psychological well-being in both groups.

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measures. This open-label, parallel three-armed ran- domized controlled trial compared a yoga interven- tion plus continuation of standard care (medication, nutrition prescription, peer support) with standard care commis- sioning of medications and diet, and standard care (oral meds plus basic lifestyle education). Results showed that FBS improved in all three groups but did not reach statistical significance. While participants of a yoga study stated, “I could move mountains”, Alexander et al. concluded that a major limitation of this systematic review of controlled trials is Diabetes Re- view. 6. Kabat-Zinn, J. On Defining Mindfulness. Available at https://www.nimh.nih.gov/health/publications/med-symposium-accessed-8/2017.


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