

Embracing Disruptive Technology . . . A Well-Planned Interruption is Often a Good Thing

by [Monarch](#) | Oct 10, 2015

Excuse the interruption. . . . But, that's what I do. I'm Endotool, and I'm a disruptive technology.

Disruptive technology, of course, is nothing new. It existed long before the phrase was coined by Harvard professor Clayton Christenson. After all, the first wheel, crudely fashioned out of uneven stone, was a disruptive—it changed everything. Essentially, a disruptive technology is an innovation that alters the status quo and displaces existing technology. This is with the underlying assumption, of course, that it represents change for the better.

Disruptive technology and its cousin disruptive innovation have been getting a lot of attention lately in healthcare. Christenson even wrote a book about the latter and how it can solve a plethora of today's healthcare problems.

But, let's face it. Not everyone likes change, particularly in healthcare. Change is stressful, demands that clinicians learn and implement new procedures and can make workflow frustratingly slow as it is first implemented. Moreover, not all new technology is actually poised to displace the status quo. A new hospital device or tool may simply constitute an alteration in your work environment that is an impediment accomplishing your job. If it's change for change's sake alone, the technology does not really meet the definition of disruptive. Perhaps hospital management thinks it's a benefit or a new supervisor has used it in the past. Perhaps, quite frankly, it's just an annoyance.

But dedicated professionals should be alert to and embrace positive change. Recently healthcare has seen a number of exciting new technologies that seem truly to fit the profile of disruptive. 3D printing that can allow physicians to sculpt bones optimized for a particular patient and literally watch them emerge in minutes from a device. Small, easily maneuverable OR tools are enabling growing number of minimally invasive surgeries not even imagine a few years ago. Rapidly advancing genetic diagnostic testing promises to catch diseases earlier and cut healthcare costs.

So too, Endotool is an up and coming disruptive technology. It replaces the dated paper calculations and traditional computerized protocols for glucose management with truly personalized measurements predictive of how a patient is actually metabolizing sugar in near real time. Endotool (that would be me) relies on highly accurate predictive algorithms to optimize IV insulin dosing for even the most complex patients, including those with sepsis, burns, and hyperglycemic crisis states, such as diabetic ketoacidosis (DKA) and hyperosmolar nonketotic syndrome (HNS). It makes a genuine difference in patient care. Studies already reviewed in this blog have demonstrated a wide range of benefits.

Working with the system may take a little extra time at first, and definitely requires a change in routine. But ultimately, it will speed clinical workflow, achieve optimal glucose levels more quickly than traditional methods and deliver better patient care. It promises to change the way glucose dosing is managed for hospitalized patients for years to come. So be prepared, I may be a bit disruptive--although I don't really mean to butt in. However, clinicians who truly are truly dedicated to patient care and want to practice better medicine will want to get to know me. I hope you will too!

Take Control of Your Inpatient Glycemic Control...

by [Monarch](#) | Sep 9, 2015

...Speak UP About Diabetes

If you're a patient with diabetes, you are accustomed to managing diabetes and maintaining appropriate blood sugar levels on a daily basis. Many people with diabetes have mastered the principles of glucose management and successfully put them into practice every day.

When you're receiving medical care, don't let this positive attitude stop at the hospital door. Visiting a hospital using advanced [glycemic control management tools](#), such as EndoTool, will provide a greater level of confidence and safety. However, familiarity with diabetes can vary widely, so it is best to be prepared with feedback and instruction for your caregivers.

The [Joint Commission recommends](#) that anyone with diabetes should keep these five guidelines in mind when receiving hospital care:

Stay on top of your inpatient glycemic health. Always wear your diabetes ID, and make sure all caregivers are aware of your condition. Understand how often your glucose levels will be checked. Understand any changes that will be made to your diabetes care regime. Alert nurses to any symptoms consistent with hyperglycemia or hypoglycemia.

Master your inpatient medications. Know exactly what new medications you will receive while hospitalized, their potential impact on blood sugar levels, and how this will be addressed. Pay particular attention to anesthesia drugs. If you receive insulin in the hospital, understand why, when and in what form. Make sure any rapid acting insulin dosing accompanies a meal. If you experience nausea or vomiting as a result of your illness, notify your caregiver.

Understand how your treatment will affect your diet. Inquire whether your hospital meals will support your target glucose range and how to alert staff if your diabetes medication or food is delayed. Know how glucose levels will be managed if you are unable to eat and when you will resume normal meal schedules.

Manage your infection risk. Diabetes is a risk factor for infection. Therefore, wash your hands frequently and make sure caregivers do the same or wear clean gloves. Alert nursing staff to any cuts or sores that do not heal. Avoid all sick visitors until you are recovered.

Plan your transition to an outpatient environment. Find out what to expect with regard to blood sugar levels as you recover, what may signal danger, and when to call a doctor. If you are being prescribed insulin for the first time following hospitalization, make sure you understand dosing procedures. Be sure to ask when you can resume your normal diet, medications, and exercise.

Get Onboard with Insulin On Board Management...

by [Monarch](#) | Aug 26, 2015

...Don't Let Residual Insulin Rock the Glucose Management Boat

While dosing protocols may be carefully calculated, a hospitalized patient's need for insulin may change quickly based on a wide range of factors. Insulin therapy must follow suit.

Compared to paper protocols and lookup tables, computerized insulin management solutions enhance ease of use and accuracy. However, many computerized systems rely on the same imprecise protocols as manual methods and fall short of achieving optimal glycemic control. To truly manage glucose care, hospitals should not only computerize treatment, but individualize treatment.

One of the major factors that affects insulin dosing is estimated residual extracellular insulin (EREI), often referred to as insulin on board. EREI is simply residual insulin in the body from a previous method of insulin therapy, which will continue to act on blood sugar levels for some time going forward. Without accounting for this, excess insulin builds up and results in insufficient blood sugar levels.

Failure to properly account for the effect of EREI is one of the major causes of hypoglycemia and ongoing glucose blood level swings.

In 2011, a [Canadian study](#) compared the effects of a computer-directed intravenous insulin system to a traditional paper-based nonogram for cardiovascular patients. It found significant improvements in glucose control but at the same time were faced with higher hypoglycemia episodes. The inability to accurately control for on board insulin figured prominently into the cause. Patient-specific factors related to insulin and glucose metabolism also played a role.

To deal with this, EndoTool® Glucose Management System takes computerized insulin dosing a step beyond traditional management by incorporating an EREI calculation. It estimates how much insulin remains in the body from prior dosing, based on a patient's unique physiology and prior insulin response before calculating the next dose. If the patient has significant EREI, the insulin dose may be reduced. If current EREI levels cannot be supported by circulating glucose, EndoTool may also recommend a counter-balancing dextrose dose. Unlike simple computerization of existing protocols, EndoTool also assesses a patient's overall glucose state on an ongoing basis and incorporates this information into dosing.

That's a major step towards personalized medicine and individualized treatment.

Hyperglycemia – Too Much of a Good Thing

by [Monarch](#) | Aug 19, 2015

Yes, you can have too much of a good thing! Case in point—sugar. Too much sugar in your blood has a wide range of negative consequences.

High blood sugar can negatively affect patients who fail to produce sufficient insulin to metabolize the sugar contents of their blood. Aside from patients with diabetes, hyperglycemia can result from medical conditions. Stroke or myocardial infarction (heart attack) patients, patients who have problems with the thyroid, adrenal, pituitary gland, pancreas, and patients who undergo major surgeries may also go into a hyperglycemic state.

Initial signs of hyperglycemia include hunger, thirst, frequent urination, and fatigue. Sustained high blood sugar levels have far greater impact. They may lead to skin infections and impaired healing, stomach and intestinal difficulties, and eventually eye, kidney, and nerve damage. The condition may damage blood vessels and the organs they support, resulting in blindness, heart attack, stroke, and limb amputations.

Prolonged hyperglycemia also may lead to a condition known as ketoacidosis. Overwhelmed by sugar, the body ceases to produce insulin, or diabetic insulin therapies become ineffective. Fat, rather than sugar, is then broken down for fuel. This result is a buildup of toxic ketones: a byproduct of fat metabolism. The syndrome is characterized by a shortness of breath, fruity breath odor, and nausea. Ketoacidosis requires immediate medical attention. If left untreated, it may result in coma and/or death.

Hospitalized patients, whether or not they have diabetes, may be treated with insulin to keep their blood sugar levels under control. Today, new technologies have been introduced to optimize insulin dosing to the particular patient.

If you are a clinician, how do you monitor and adjust patient glucose levels?

Do you find this method effective?

Hypoglycemia – How Low Can You Go?

by [Monarch](#) | Aug 4, 2015

How low can you go? When it comes to sugar levels and you begin to experience hypoglycemic symptoms, it depends on who you ask.

According to the American Diabetes Association, [“hypoglycemia is a condition characterized by abnormally low blood glucose \(blood sugar\) levels, usually less than 70 mg/dl.”](#) While the Endocrine Society classifies hypoglycemia as a clinically low blood glucose level accompanied by evidence of side effects associated with the condition.

During a hypoglycemic event, the brain is deprived of the glucose it requires for fuel, resulting in impaired functioning. This can range from confusion, exhaustion and numbness, to slurred speech and impaired cognitive abilities. In some cases, it may result in dangerous incidents such as seizures and loss of consciousness. In the most severe cases, when acute and lengthy, hypoglycemia can be fatal.

Hypoglycemia is commonly associated with diabetes treatment, with the administration of excess insulin. It also can be a reaction to fasting and a variety of other factors, including poisons, alcohol, hormone deficiencies, and tumors. Metabolic changes due to infection and organ failure also can drive down glucose levels.

Hospitalized patients may suffer from hypoglycemia as a result of their treatment. These include restricted diets, administration of certain medications, or improper insulin dosing in an effort to stabilize levels.

The latter is common in many hospitals today and poses a significant risk for patients with diabetes, whatever their primary illness.

Hypoglycemic symptoms are generally divided into three categories:

- Stress-related, due to the release of epinephrine (adrenaline). These include shakiness, anxiety, heart palpitations, and sweating or chills.
- Glucagon-related, due to the body’s attempt to raise sugar levels through release of glucagon hormones. These include hunger, nausea, vomiting, and headache.
- Brain-related, due to a lack of metabolic fuel for normal functioning. These include impaired judgment, fatigue, headache, slurred speech, and poor coordination.

Whether hospitalized or not, patients can experience hypoglycemia symptoms even while sleeping. Hypoglycemia can be treated through the ingestion of high-sugar foods, administration of specialized medications or patients may receive glucose through an IV drip.

Blood Sugar Levels – Speak Greek

by [Monarch](#) | Jul 28, 2015

[Hyperglycemia](#). [Hypoglycemia](#). What's the difference? What's the significance, if it's all Greek to you?

Hyper, derived from Greek, means above, or in excess; while *glyc* denotes sweet, and *mia* means in the blood. Together, they mean too much glucose in the blood. *Hypo*, also Greek, means less than normal or deficient, in this case too little glucose in the blood.

Both conditions are commonly associated with diabetes but can be an issue for patients with a wide range of illnesses. Maintaining appropriate blood glucose levels is important for everyone—particularly hospitalized patients. The likelihood that hospitalized patients with diabetes will experience complications is greater than patients without diabetes because their ability to modulate blood glucose through appropriate insulin-glucose feedback mechanisms is already impaired. Serious illnesses creates additional stress. Moreover, daily blood glucose maintenance programs are often altered when people with diabetes are hospitalized, compounding the problem.

[Normal fasting glucose levels](#) range from 80 to 110 milligrams per deciliter (mg/dL). Levels above 126 mg/dL are considered hyperglycemic. Generally speaking, blood glucose readings below 70 mg/dL may be considered hypoglycemic, but definitions vary within healthcare organizations and based on individual patients.

Whatever the cause, the consequences of prolonged periods of hyperglycemia or hypoglycemia can be extremely serious and negatively impact numerous health issues, predominantly for hospitalized patients.

We'll explore the consequences of abnormal blood glucose levels in greater detail in upcoming blogs. Meanwhile, if you are a clinician, what is your facility's goal range

Holy Cross Hospital Successfully Combats Hyperglycemia...

by [Monarch](#) | Jun 4, 2015

...in its Induced Hypothermia Patients with Leading Edge Technology

Named one of the [100 Top Cardiovascular Hospitals](#) in the nation, Holy Cross Hospital is a 571-bed hospital in seaside Broward County, Florida. Embracing a strategic intervention for unconscious cardiac arrest, brain injury and stroke patients, Holy Cross successfully introduced a [hypothermia \(IH\) program](#). This program reduces core body temperature below 94° F [35° C] to improve neurologic recovery.

However, such a dramatic change launches a host of related physiologic consequences—mostly undesirable. One is a decrease in insulin sensitivity and secretion, often resulting in hyperglycemia. Patients already suffering multiple complications are often extremely vulnerable to the impact of these high blood sugar levels.

To address this problem initially, Holy Cross relied on its existing paper-based protocol for intravenous insulin dosing for these patients. Despite hourly insulin checks combined with hourly upward titration of the insulin protocol, patients remained hyperglycemic. When circulating blood glucose levels dropped, patients were then removed from insulin drips with little control, resulting in the familiar pattern of alternating hyper- and hypoglycemia.

Two years into the program without satisfaction, Holy Cross implemented the [EndoTool® IV](#) application to individualize insulin dosing. As a new patient is added, the software uses previous blood glucose readings and various clinical data points to customize their dosing curve. Following this, nurses input current glucose readings, and dosing is automatically adjusted. The frequency of patient glucose checks rapidly diminished from every half hour to every two hours as glucose levels stabilized.

As a result of eliminating risk factors and time bottlenecks, patients completing hypothermia treatment at Holy Cross Hospital were safely removed from the insulin drip without experiencing hyperglycemia or negative side effects.