

Can Diabetes impact the use of Supply Chain Technology

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Abstract

Diabetes type II is a controllable condition, with a combination of medication and diet. The most important part of the combination is the information given to bring this all into balance. Education of this condition will enhance one's quality of life. The information provided will assist in the following; 1) How insulin affects the brain. 2) Sleep patterns are impacted by this condition. 3) Blood pressures have problems with being elevated by this condition. 4) The impact on current healthcare costs. 5) Tools

needed to assist in the management of this condition. 6) The tools needed to manage this medical condition. Technology begins to be more involved in the management of this condition. When one understands, what they are facing, it is easier to maintain or improve the quality of life one has to live. It will help the loved ones be supportive throughout managing this condition.

Introduction

Many medical health providers claim they have the appropriate care path for treating Type 2 Diabetes. Some are accurate, thus not 100 percent of them. It may be the way; it is communicated to the patient. Although this review goes over an assortment of medical terms, procedures and actions, there is a traditional theory to motivate the patient to control their own fate. It is, when "Self – care" is achieved and the patient is following / understanding the medical instructions given. An analogy of this would be compared to football. Quarterback (Doctor) lays out the plan to score

successfully. The medical support staff initiates the plan (front – line), which gives way to the Patient (running back) to score a manageable life.

Diabetes Type II

In today's society having diabetes is a serious issue. Diabetes also known as mellitus is metabolic disease, and is mostly found in people who are overweight. Type 2 diabetes (T2D) is a chronic disease in which blood glucose levels increase due to the lack of effective insulin to be produced. Diabetes is also related with having complications. The complications include renal failure, nerve damage, heart attack, stroke, kidney disease, nerve damage and peripheral vascular disease. One way to treat Type 2 diabetes is to optimize blood glucose levels. At 10 years post-diagnosis approximately 50% of people with T2D will require exogenous insulin to maintain optimal glycaemia. In Australia, people with Type 2 Diabetes go through treatment in a general practice. However, when insulin initiation is needed it is not occurring in a timely manner of the primary care physicians because they are more likely to delay the distribution of insulin compared to specialist. Hypertension is a state of great psychological stress or having an abnormal blood pressure. Hypertension is defined as a systolic blood pressure (SBP) ≥ 140 mm Hg or diastolic blood pressure (DBP) ≥ 90 mm Hg.

Anyone can maintain a level of "Quality" life, with all tools available to manage Diabetes type II. Each person needs to be health literate and the medical provider will be an integral part of this success. The provider's staff will be assist in keeping this personal goal in perspective.

Insulin and the Brain

The brain is considered an insulin-insensitive organ. The location of insulin and its receptors in the brain have shown doctors new ways of considering this hormone responsible for several functions. The origin of insulin in the brain is from peripheral, central sources, or both. Regardless of whether insulin is of peripheral origin or produced in the brain, this hormone may act through its own receptors present in the brain.

The molecular events through which insulin functions in the brain are the same as those operating in the periphery. However, certain insulin actions are different in the central nervous system, such as hormone-induced glucose uptake due to a low insulin-sensitive GLUT-4 activity, and because of the predominant presence of GLUT-1 and GLUT-3. In addition, insulin in the brain contributes to the control of nutrient homeostasis, reproduction, cognition, and memory, as well as to neurotrophic, neuromodulatory, and neuroprotective effects. Alterations of these functional activities may contribute to the manifestation of several clinical entities, such as central insulin resistance, type 2 diabetes mellitus (T2DM), and Alzheimer's disease (AD)."

Chemicals mix to keep the homeostasis "normal" for all to exist. Medical tests will help keep track of any changes, which affect what is normal. The tests enable to catch any bad changes to our nerves and motorskills.

Brain changes

"Diabetic retinopathy (die-uh-BET-ik ret-ih-NOP-uh-thee) is a diabetes complication that affects eyes. It's caused by damage to the blood vessels of the light-sensitive tissue at the back of the eye (retina). At first, diabetic retinopathy may cause no

symptoms or only mild vision problems. Eventually, it can cause blindness.

The condition can develop in anyone who has type 1 or type 2 diabetes. The longer you have diabetes and the less controlled your blood sugar is, the more likely you are to develop this eye complication.”

Everyone needs to understand the importance of monitoring blood sugar levels. Regardless of age, unmonitored blood sugars can take away one of our five senses. It reinforces the need to know everything needed to maintain a satisfactory blood sugar level.

Motor Imagery and Aging

Motor Imagery (MI) is a mental simulation of something without any force. It's popular and is common in sport rehabilitation. It requires the brain to repeatedly imagine movements dealing with the brains motor functions. The brain can view the world as involuntary behaviors. Motor imagery is classified into three dimensions: vividness, temporal characteristics of simulated movements, and the accuracy of MI. The vividness comes from the clarity of what is perceived through mental simulation.

Health Care and Self Care

A Health Care system with coordinated health care interventions and communications for self-care patients is significant. Disease management supports the doctor or patient's relationship to the plan of care and also emphasizes prevention of complications with the help of guidelines and patient empowerment. It evaluates the economic outcomes from a basis approach with the overall goal to improve overall health.

This system should be affordable to all. It should be coordinated with Insurance

companies not dictated by government officials. The system should be agreeable to the medical, as well as, the patient involved.

Self-Care

Self-care is what everyone wants, because we all have worked toward independence. We wanted to show our parents that we could be successful, if we were given the chance. Each and every one of us wants to show our strength on being independent. We all have to understand, aging is inevitable.

Marriage is one aspect of self-care, which our partner is supporting us in our care. Our partner wants to be there, because our beliefs are the same. We are not there to overwhelm the other. We certainly are not there getting paid to take care of the other. If someone else is taking care of us, thus getting paid, then it would show weakness. America has a reputation of being “strong minded” and it is hard to overcome.

Self-Management Education

A lot of Americans aren't informed about the self-care of type 2 diabetes. The condition requires constant management. Inducing insulin into the blood stream can be an overbearing task. Studies in the US, performed in 2010, estimated that only 80% of Americans had knowledge of performing the health procedures. The experiment had two groups in which one was the control, which received written information. The other group had internet access to the information. The age group ranged from elderly Americans ranging from 55-80 years of age. The study took place for four months before a conclusion was made. Experts concluded that the experiment group that had the internet access was more successful in self-management. Not only did the internet help in managing type 2 diabetes, but it also helped with glycemic control.

Healthcare and Reform

The insulin pump is very important when it comes to type 2 diabetes. The first situation involved a patient who had an insulin pump for over 15 years. The pump eventually stopped working, so the patient requested a new pump but the process was delayed. At this time her hemoglobin levels had risen to 8.5% from a 7.7%. The hassle for a patient receiving a new pump is not the ideal loving America the country tries to portray. Young physicians who just completed their training don't appreciate that today's administrative burden for seeing patients is new, and perhaps they won't be as concerned as many of us are. And perhaps having greater restrictions for formularies will result in a better quality of medicine. In the case of type 2 diabetes, we don't know at this time which agents are the best for diabetes end points and, for that matter, non-diabetes-related outcomes over time. We hope, as the cardiovascular outcome trials are completed, that we will have a better understanding of this important topic.

Sleep patterns /rhythms

Circadian rhythms are pervasive in nature, and are shown in every physiological process. In mammals, circadian rhythms are controlled by the brain clock in the nucleus of the hypothalamus that controls activity throughout the brain and body. Progress has been made to help understand the basic functioning of the circadian clock at the level of genes, molecules, and cells. Totally understanding of how they interact with complex systems is still unclear. Much of the work relies on circadian clocks from disorders ranging from cancer, diabetes, and obesity. The rise in obesity has cost the economy a lot of money in treatments and managing disorders such as heart disease. Understanding the development of obesity and unregulated metabolic is crucial.

The sleep pattern (circadian rhythm) has been disrupted for all. The causes are due to school, work, illnesses and children to say a few. We all think that it is acceptable for this to occur. This has now put into a new perspective. We need to have a normal rhythm to maintain our homeostasis. Homeostasis is a balance of everything, which includes sleep. The one thing needed to recharge the body for the next day.

Muscle mass in Diabetes type II patients

“Most individuals with diabetes are obese and have bigger muscle mass, so we could think that they might have enough muscle mass to prevent sarcopenia with aging. Actually, in the Health, Aging, and Body composition Study (Health ABC), older adults with type 2 diabetes had a greater muscle mass in their arms and legs than those without diabetes. However, in older adults, type 2 diabetes is associated with excessive loss of skeletal muscle mass, as well as lower muscle quality and strength.”

Each one of us needs to realize that exercise, proper diet and medications can help in maintaining balance. Exercise generates metabolism for the glucose/insulin levels. Diet helps monitor the sugar taken in. Medications given from the medical team are to help, when the other two fail.

Skeletal Muscle Fatigue

It is usual to make a distinction between muscle fatigue and muscle injury. Fatigue is usually defined as the reversible decline of performance during activity, and most recovery occurs within the first hour. Muscle injury also causes a decline in performance that reverses only very slowly. Muscles that are stretched during contraction (eccentric contractions) are particularly prone to injury or damage. Injury is characterized by structural abnormalities including sarcomeric disorder, membrane damage resulting in the

loss of soluble enzymes such as creatine kinase, and inflammatory processes including cytokine release and phagocytic cell infiltration. Recovery from the most serious injuries involves activation of satellite cells and regeneration of damaged fibers. If a muscle is stimulated continuously at a frequency close to that which gives maximal force, then force production generally shows a rapid decline (Fig. 2) often called high-frequency fatigue

Gender related Information

“A growing number of experimental evidence shows that there is gender effect related to type 2 diabetes (T2D). For instance, individual SNP test results indicate moderately differential signals between male and female population (Wu and Cui, 2013), and there also exists sex difference in the impact of T2D on coronary heart disease risk (Juutilainen et al., 2004). Therefore, we are specifically interested in identifying sex-specific pathways associated with T2D with the hope to gain novel insight into the disease etiology of T2D in different sex groups. We applied four different two-step methods including SCC, ARTP, MGSEA and GSS to two nested case-control cohort T2D datasets, the Nurses’ Health Study (NHS) and the Health Professional Fellow up Study (HPFS), which are part of the Gene, Environment Association Studies (GENVEA) (Cornelis et al., 2010).”

These points out to me, T2D does not discriminate, between the sexes. Men and women will be subject to T2D. It is how we accept our condition and how we apply the information received. Women take the information and apply it better, than men. I feel it comes from the females having a sense of “taking care of the family” driving them forward.

Gender Differences in Control of Cardiovascular Risk Factors

Gender has a great impact on the body when it comes to gender. The study performed had controlled primary outcomes as well as individual composite control. Composite control is having all three outcomes in control for male or female, while still adjusting relevant covariates. The results were 56% men and who made \$35,000 annually. Adjusted linear regression showed a mean diastolic BP of 3.09 to be higher in women than men. 12.4% of the sample had composite control. Women overall had a lower composite control over men when it applies to the body having cardiovascular risks.

Statistical Data

Chronic diseases represented seven of the top 10 causes of death in 2010 in the United States.

This information formulated from 2010 data

1. Diseases (Heart)	All together accounted for
2. Cancers	65.8% of all deaths among
3. Chronic Lower Respiratory disease	U.S. males and 67.2% of all.
4. Cerebrovascular disease (Brain disorders)	deaths among U.S. females
5. Diabetes Mellitis	
6. Alzheimer’s Disease	
7. Kidney disease (Nephritis, Nephrotic Syndrome, Nephrosis)	

Chronic disease risk factors, including smoking, poor diet, insufficient physical inactivity, and excessive alcohol consumption, were the leading actual causes of death in 2000.”

Global Impact of Diabetes

Globally there has been an increase in the number of people who suffer from diabetes since the past two decades. Diabetes mellitus is now one of the dangerous threats to human health in the 21st century. It is a public health challenge commonly related to with morbidity and mortality. 171 million people in the world live with diabetes, and that number is expected to increase to 366 million by the year 2030. People living with diabetes in the United Kingdom is steadily rising. Managing diabetes is the patient's responsibility on a day-to-day basis. It requires a range of skills including exercise, dietary management, foot care, blood glucose testing, and medication therapy.

This study pointed out that no single provider can start and maintain this balance alone. Diabetic Certified Nurse Educators play the most important part with maintaining a favorable outcome with the patients. In the U.S.A., DCN's are required to have 1000 hours of diabetic patient interaction. This is included with being up to date on Technology and latest statistics of success rates. In comparison, in Australia these providers are required to complete a Graduate Certificate course and acquire 1,800 hours of patient self - management.

The study took information from over $\frac{1}{2}$ of the Diabetic Nurse Educator and less than 1/5 of the remaining participants. The DCNE's should have the largest input for the study. They are the largest component involved with the parents.

Relational coordination – is defining the relationship and coordination of the duties

introducing insulin for the treatment of the Type 2 diabetes.

The analysis of the study was formatted into six stages:

- 1) How much was each provider familiar with the program
- 2) Identification of the different parts of the program
- 3) Indexing the responses
- 4) Charting the results for the patients
- 5) Investigation of any problems they might

Involving Insulin Injections for type 2 diabetes, in the general office setting. The doctor directs the patient to go diabetic classes, then go over the dosing procedure with their registered nurse. The doctor calculates dose based on weight and blood sugar levels.

The roles and responsibilities are clearly defined:

Patient – is center of the treatment

Doctor – directs the care for the patient

Nurse – follows the Doctor's orders for the patient

Support Staff – educates and supports patient through this learning process (Lab and Pharmacy)

Nurse practitioners are extension of the provider trained to treat diabetic patients.

The study was completed after interviewing general practitioners, practicing nurses, diabetes nurse educators, and physicians. It was a total of 21 people attempting to get treatment.

The themes of the study were universal;

*Health care professional communication – How effective is it? Definition of the roles!

* Initiating insulin for Type 2 diabetes – Uncertain competency and capacity!

*Consistency needed relationships and communication.

*The need to develop trust and respect between healthcare professionals and patients

The need to initiate, or start treatment, is growing from the importance Insulin plays in the homeostasis of balancing insulin with sugar in the body.

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Factors influencing attendance at structured self-management – Diabetes

Factors affecting self-management of diabetes are concerning to the medical experts. Between what they have seen in the past, this includes the patients they are treating today, will double by 2030. This is less than 15 years away!

One system that the experts need to look closely at, which is working in diagnosing and treating diabetes is in England. They have established structured Self-Management Education (SSME) programs:

*Diabetes Education and Self-Management for ongoing and newly Diagnosed (DESMOND).

*Expert Patient Education versus Routine Treatment Program (X-Pert) – Type 2 Diabetics.

*Dose adjustment for normal eating (DOFNE) – Type 1 diabetes

The great things about these programs are:

*The knowledge of this disease has been raised. Patients are better informed about their conditions.

*The programs are able to blend education of diabetes, Types I and II, with hands on activities to bring this into a clear understanding, thus relieving the mental anguish of having diabetes.

Having all this information available, according to the statistics, less than 1/10 of diabetic patients take advantage of this. In the USA, this type of program is called "Chronic Disease Management Program (CDSMP).

They looked at cost savings: (data from Information given)

- 1) *Healthcare self-care management and healthcare use
- 2) *The health care costs by age groups
- 3) Savings given to the American adults
- 4) Participants cost
- 5) Cost savings, after deducting costs
- 6) Separating savings to general populations from census data

They found that through all of this health care costs were down: (ER) Emergency Room visits were down, as well as, hospital stays.

Most of all results within this study dealt with education, recall of education, medical provider interaction and support of family. The results were recorded from surveys given to patients. The data was relating to past classes of healthcare interventions/interactions. All data was collected and ultimately connected to a monetary value.

Most responders are male, married and over the age of 50 years old. They are majorly concerned for their wellbeing, because they have families. They want to be around to see future grandchildren!

Applications from Technology will help Diabetes Type II patients

“An Apple a day can save a day!”

Apple Corporation has brought a new tool to the healthcare setting dealing with diabetes. Of course, they had Medical collaborators to help the delivery of this new application named “Research Kit”.

This puts a new twist on this device, we use every day to talk about our daily lives. Now they can convey to their medical provider and have live data from them to review about their condition.

To add to the mix, Apple is also connecting healthcare providers up with their patients, who suffer from asthma, breast cancer, heart disease and Parkinson’s disease. Apple is concerned about privacy, thus the participants get to say how their data will be distributed. Personal and accurate care are the goals.

This will truly have a global impact, because anyone with this application can reach their provider at a moment’s notice.

Cost savings in medical studies for development of medications will be noticed. Users can choose the study and respond immediately from the application. Drug companies will not have to wait for physical mail outs to be returned. The users will feel it in their wallets, not spending money, for gas to arrive at a facility.

For the Diabetic patients, this application will assist their providers to see their diet, physical activity and medications in real time. This application will allow the providers to record the impact these factors have on blood glucose levels, as it happens. They want the users to know how they are taking on a real time role in the management of their condition.

Also some of the quality improvement initiatives targeted at promoting education on diabetes, task delegation, changing clinic setting and workflow, collaborative care and case management, self-care promotion, doctor-nurse team dynamics and web based data monitoring platforms which incorporate the care protocols and a validated risk engine support the team to arrive at a decision and provide periodic feedback, was observed to have largest effect in improving cardio-metabolic risk factors.

Technology like Fast-acting insulin analogues have better ease than regular insulin. Long acting analogues decrease

glycemic. Insulin analogues are more expensive than regular and neutral protamine Hagedorn insulin. In comparison with intake of multiple injections daily, an insulin pump therapy has been observed to be associated with a modest improvement in glycemic control and may be associated with decreased frequency of severe hypoglycemia. It has been recorded that the quality of life has improved and the rate of pump discontinuation is low. A continuous glucose monitoring can improve glycemic control in children without increased hypoglycemia. The sensor-incorporated insulin pump with low glucose suspension reduces rates of severe hypoglycemia and nocturnal hypoglycemia. Although technological innovations can improve diabetes outcomes and quality of life, maintenance of optimal glycemic control continues to be largely dependent on patient and family motivation, competence, and adherence to daily diabetes care requirements. The effective translation of technological innovations into clinical practice is costly and requires a substantial investment in education of both practitioners and patients/families. Closed-loop "artificial pancreas" systems are currently in development and show great promise to automate insulin delivery with minimal patient intervention.

Diastolic (Blood Pressure)

It was noted in this study, heart failure risks connected to diabetes were not clear. The providers have designated left ventricular diastolic dysfunction as the primary cardiac change. They compared this with:

*Metabolic Syndrome

*Insulin Resistance

*Diabetes

The study throughout tried to prove heart conditions, thus blood pressure problems

noted, were in place prior to the diagnosis of diabetes. All participants had fasting blood sugar draws.

(ECG) Echocardiographic studies were done on video for later review by cardiologists.

Thresholds were chosen:

*Fasting glucose at least 126 mg/dl x 2 blood draws

*>200mg/dl 2 hours after oral glucose tolerance test

*>200mg/dl anytime with symptoms hypersensitivity

Patients with risks for blindness are where these thresholds come from. Both, men and women are at greater risk to die from heart disease complicated with diabetes, than heart disease alone.

Newly diagnosed patients have higher risks for kidney disease, loss of eyesight, heart attack, amputation, stroke of death.

Pilot Study

Scenario: spinal surgery the subject is male. First information: You (subject) are thinking of having planned surgery at the community hospital to correct a spine problem that has caused pain for several years. [Some of the bones in your back – the vertebrae, have slipped out of their correct position.] Your surgeon explained that you would be receiving general anesthesia and you are expected to be in the hospital about 3 days. You are 30 years old and in excellent health other than your back pain. You are not overweight, you do not smoke, and you do not drink alcohol. You are Caucasian of northern European descent. In college and high school you participated vigorously in weight-lifting and football. You developed back pain in your junior year of college. This is what you know about your family history:

Mother's side Father's side Family member condition Family member condition YOU Spondylolisthesis: a condition in which the bones in the back slip out of place – more common in athletes. Had several concussions and sprains playing football, but no other history of significant injury. Has been followed by a neurosurgeon for three years. The doctor says the slippage is now a “grade 4” and non-surgical options for treatment will not be effective. Mother Age 60 Hospitalized 2 years ago to remove a neck tumor. While in the hospital she developed pneumonia and developed blood clots in her leg and shoulder Father age 62 Arthritis in his knees Mat gr. (83) Congestive heart failure Pat gm (85) Cataracts Mat gf (85) Uses eye drops daily, but you don't know why Pat gf (90) Deceased – had at least 2 heart attacks Siblings Sister (27) Lives in another city. Had a baby last year and had some trouble with her pregnancy, but you don't know what it was. Subject now puts whatever information he remembers into the device and receives feedback. If she includes the information about his mother, he will receive the following:

Diabetic Type 2 patients, according to the study, are less likely to survive their 1st heart attack. Diabetic Type I patients would be much better.

ECG Data from stress tests showed 50% more complications with diabetic complications, compared to heart issues and stage 1 Diabetes.

“High Blood Pressure” (Hypertension) is present in 60% of Type 2 Diabetic patients. High Blood pressure can be modified to lessen the mortality rates, due to diabetes complications.

Low muscle mass associated with Diabetes Type 2

Everyone realizes, when we age, our body mass changes with us. The study mentioned 600 million people were recorded, as 60 years or older. The population of 60 years or older is due to double by 2025.

Sarcopenia, which is a loss of muscle mass, is becoming prevalent in the aging process of Diabetic patients. The Diabetic Type 2 patients have muscle mass in their upper body. The problem is noted in the lower extremities. The study done had 144 Diabetes Type 2 patients of oriental ethnicity, evaluated on this criteria:

- Body weight
- Height
- Blood Pressure
- Fasting Bloodwork
- Body Composition X-Ray

After these tests were acquired, they assessed that Sarcopenia was apparent to be higher in men than in women. Therefore, they added that Scarcopenia is more apparent in Type II diabetes, than in patients without diabetes.

Clear causes of low muscle mass have not been determined. This indicated further studies need to be done.

We have an understanding of how muscle mass is important for upper extremity strength. We are just unsure on how to maintain it for our golden years. Even the survey takers are looking at the future with past data.

Brain Alterations affected by diabetes

I need to point out in this study stated that 30 million patients have been diagnosed with Dementia. You need to compare that statistic to the overwhelming number of 285 million aging patients battling with diabetes. This

study leans towards diabetes causing incidents of dementia. These incidents are increasing in numbers.

According to this study, experts say, diabetes causes problems in functioning and structural problems in the brain. Her first things noticed are: overall size, makeup and fluid of the brain. X-ray (MRI) is the tool used to determine all of the brain structures attributes. Significant loss of spontaneous brain activity is used to determine what matter of the brain loss.

Clinical Symptoms – Clinical Symptoms in Dementia with Diabetes

Diabetic patients – Loss ability to remember

- Behavioral changes dramatically
- Lacking normal daily living skills
- Slow to process new information
- Attention loss
- Apathy (no feeling)

Visual losses or changes are affected by diabetes. Diabetes affects the blood to the brain exchange. This can grow up into leading to strokes, which is even harder to come back from.

High Blood Sugar (Hyperglycemia) causes sugar to be higher than normal, which slows the brain's functions to metabolize (remove, a.k.a. Hypometabolizes). Brain dysfunctions like this can lead to tipping the scales, overeating the excessive sleeping.

Low Blood Sugar (Hypoglycemia) in elderly patients is a bad thing. The elderly brain, runs mostly off of sugar, so that cup of coffee with milk, cream and sugar can be a good thing. Having low blood sugar for a significant amount of time can affect the

brain in an adverse way. One serious way is developing Dementia.

Hyperinsulinemia – Brain insulin signaling

This process is affected in a negative way of a diabetic patient. Insulin is produced in the central nervous system. The problem usually leads to brain dysfunctions. Exercise has shown to be effective in keeping insulin flowing properly, thus having good results on memory of Diabetic patients.

Alzheimer's, according to the study, is developed from mutated protein. This protein deposits in the brain, as plaque, which alter mental functions. These plaques can also lead to strokes in the brain.

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