**Case22: Type 1 Diabetes Mellitus**

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1. **Understanding the Disease and Pathophysiology**
2. *Define insulin. Describe its major functions within normal metabolism.*

Insulin is defined as “a hormone that is produced by the beta cells of the islets of Langerhans in the pancreas to regulate blood glucose. It promotes the uptake, utilization and storage of nutrients” (Nelms, 470). Insulin is an anabolic hormone that helps control the fat of carbohydrates as glucose, proteins as amino acids and fatty acids from fats. Insulin is important for the uptake of glucose in the hepatic, muscle and adipose cells. For glucose, fructose or galactose to be taken up by the cell it is necessary to have the proper transport molecule GLUT 1, GLUT 2, GLUT 3, GLUT 4 and GLUT 5. In individuals who are have insulin resistance are unable to take the glucose, fructose or galactose from outside of the cell in the bloodstream to into the cell where the energy can be oxidized, stored as glycogen or stored as triglycerides (Nelms, 476). Almost all tissues in the body depend on insulin for transportation of glucose to then be used for energy. The brain cells, and liver cells are both readily permeable to uptake glucose without the presence of insulin. Insulin is especially important because it promotes active transport of amino acids from the blood into muscles and other tissues which results in promoting protein synthesis. When insulin is present and supporting protein metabolism, this results in a positive nitrogen balance (Nelms, 477).

1. *What are the current opinions regarding the etiology of type 1 diabetes mellitus (DM)?*

Type 1 diabetes mellitus is seen in only 5-10% of all the diagnosed cases of diabetes. Normally type 1 DM is seen in children and adolescents, more recently there are cases that are diagnosed for individuals in their 80’s and 90’s. Type 1 DM is an anutoimmune response causing a gradual decline in beta cells within the individual (Nelms, 481). In type 1 DM there is a deficiency of insulin due to the destruction of pancreatic beta cells that result in the inability of cells to use glucose as their energy source. has been found that the primary gene for type 1 DM is located in the HLA region on chromosome six. It has show that there is a 40-50% genetic risk from the polymorphisms in the HLA region but there is also a risk from environmental agents that have shown an interaction of several environmental factors. According to Nelms, there are many ongoing prospective studies that in the future will provide evidence for more information on environmental triggers (Nelms, 481). There is a special type of type 1 DM called fulminant type 1 DM which has shown to have no known cause and have a more immediate and complete destruction of the beta cells, produce no insulin and are prone to ketoacidosis and have no signs of autoimmunity (Nelms, 481). There are four different areas to look at when diagnosing type 1 diabetes which include medical history, physical examination, laboratory evaluation and referrals. There are tests that include the A1C test, oral glucose tolerance test, islet cell autoantibodies that can all be completed for a comprehensive evaluation (Nelms, 487).

1. *What genes have been identified that indicated susceptibility to type 1 diabetes mellitus?*

The genes that have been identified that are indicated susceptibility to type 1 diabetes mellitus is on chromosome 6 in the HLA region (Nelms, 481). Based upon many studies completed by the NIH and continuing research they are doing, it has been concluded that the promoter region of the HLA region of the insulin gene has had the strongest correlation with type 1 DM (NIH, 2012). In the research completed it has shown to determine the alleles of encoding genes for type 1 DM, along with other genetic loci that are associated to contribute to the risk of type 1 DM (NIH, 2012). Along with the promoter region of the HLA, the PTPN22 and IL2RA have shown to have a large correlation with type 1 DM as well. Although the NIH did indicate there are other genes that have shown a presence of type 1 DM, the HLA region is always the region that is first looked at when evaluating an individuals genes for type 1 DM (NIH, 2012).

1. *After examining Susan’s medical history, can you identify any risk factors for type 1 DM?*

Based upon Susan’s medical history she has a family history of DM from her maternal grandmother. The chart does not indicate the specific type of DM that her grandmother had. Additionally, Susan reports that her meals are somewhat irregular due to her volleyball schedule, which can cause concern with her diagnosis with type 1 DM. Also Susan has come in with symptoms of polydipsia, polyuria, polyphagia, weight loss and fatigue which are all short-term complications and symptoms of DM.

1. *What are the established diagnostic criteria for type 1 DM? How can the physician distinguish between type 1 and type 2 DM?*

The established diagnostic criteria for type 1 DM is made on the basis of fating plasma glucose of greater or equal to 126 mg/dL or a casual plasma glucose of equal to or greater than 200 mg/dL with having normal symptoms of unexplained weight loss, polydipsia, and polyuria (Nelms, 486). Based upon the 2014 Standards of Medical Care there is a comprehensive diabetes evaluation that can be completed for a new patient that looks at the patient’s medical history, physical examination, laboratory evaluation, and referrals (Nelms, 486). An A1C test also called a glycosylated hemoglobin is a measure of the amount of glucose bound to hemoglobin protein. The higher the amount glucose concentration in the blood, the more hemoglobin is glycated which indicated hyperglycemia. An A1C test will measure the average glucose concentration for the previous 2-3 months because red blood cells have a life span of about 120 days (Nelms, 487). An A1C of greater than 6.5% would indicated the criteria for diagnosis of type 1 DM (Nelms, 481). A test that would not be necessary for a type 1 diabetic would be an oral glucose tolerance test because it is not used in young children and is used for screening for gestational diabetes (Nelms, 487). A test that can be done to look at autoantibody and used to screen individuals that are at high risk for developing diabetes and differentiate between type type 1 DM and type 2 DM. The antibodies test will loo at islet cell cytoplasmic antibodies (ICA), insulin autoantibodies (IAA), glutamic acid decarboxylase autoantibodies (GADA), GAD65 autoantibodies, insulinoma-associated-2 autoantibodies (IA-2A), ICA412 autoantibodies, and protein tyrosine phosphatase-like antibodies (Nelms, 487). Lastly the C peptide test is completed to measure the insulin production in the body, which is seen in both type 1 DM and type 2 DM (Nelms, 487). A physician distinguishing between type 1 DM, which is the beta cell destruction with absolute insulin deficiency, and type 2 DM, which is the progressive defective insulin secretion with insulin resistance, will use this information for their diagnosis (Nelms, 480). Normally for a type 1 DM is a sudden onset seeing many of the normally symptoms stated previously. Comparatively type 2 DM occurs over time because insulin resistance develops over many years and their clinical diagnosis is correlated with the lessening of the pancreas to release insulin (Nelms, 484). Also looking strictly at the active autoimmunity, 85% to 90% of patients have one or more circulating autoantibodies to islet cells, endogenous insulin or other antigens (Krause, 678)

1. *Describe the metabolic events that led to Susan’s symptoms (polyuria, polydipsia, polyphagia, weight loss, and fatigue) and integrate these with the pathophysiology of the disease.*

The classic symptoms of the diagnosis of type 1 DM include unexplained weight loss, polydipsia, polyuria, polyphagia and fatigue. All of these symptoms are a result from being hyperglycemic due to insulin deficiency (Nelms, 488). Polydipsia is defined as excessive thirst. Polyuria is defined as as frequent urination. And polyphagia is excessive hunger (Nelms, 470). In a patient who has type 1 DM there is decreased amount of glucose that is take up by the cells. As a result there is intracellular glucose deficiency by the cells since they are dependent on this glucose for energy and have none available which triggers gluconeogenesis in the liver as well as stimulation of glycogenolysis. So the cells in the body are hungry and not receiving the glucose they need to fuel the body, therefore the patient has signs of polyphagia. The body of the type 1 DM will the use their fat as energy and go into ketoacidosis which results in rapid weight loss, which is another symptom the patient has seen. The patient will also have a symptoms of fatigue because their body is not getting the necessary energy needed to function, and is worn down from working extra hard. Additionally, when there is decreased glucose uptake by the cells the patient will have hyperglycemia this will result in increased glucose in the blood that will get filtered through the kidneys, which have to work much harder than usual to process all of the excess glucose since they can only filter so much. The glucose is then excreted in the urine, which will cause polyuria (Nelms, 482). Also the patient has decreased sodium which leads to dehydration, therefore resulting in the patient having polydipsia (Nelms, 481).

1. *List the microvascular and neurologic complications associated with type 1 diabetes.*

Macrovasucular disease involved diseases of large blood vessels while microvascular diseases are ones that involved with small blood vessels and include nephropathy and retinopathy. Diabetic neuropathy is a condition that is characterized by damage of the nerves (Krause, 704). In patients with type 1 and 2 DM nephropathy is seen in 20-40% of the individuals. The first clinical evidence of nephropathy is low and abnormal urine albumin levels called microalbuminuria (Krause, 705). In a type 1 DM when there are chronic high levels of blood glucose this can be associated with never damage. Peripheral neuropathy usually affect the nerves the control sensation in the feet in hands compared to autonomic neuropathy which affect nerve function controlling various organ systems (Krause, 706). Individual who are type 1 DM should be screen yearly if they have had it for more than five years. Although nephropathy cannot be cured it cane be slowed to reduce the risk one’s glucose and blood pressure need to be controlled and both angiotensin-converting enzyme inhibitors or angiotensin receptor blockers should be used. Another microvascular complication that is seen in type 1 diabetics is diabetic retinopathy which is most frequent cause of new cases of blindness among adults who are 20 to 74 years old (Krause, 705). There are further complications that can occur such as glaucoma, cataracts, and other disorders of the eye but there is a screening program that is in place to detect diabetic retinopathy. A type 1 diabetic should have dilated and comprehensive eye examination by an ophthalmologist within 5 years of being diagnosed (Krause, 705).

1. *When Susan’s blood glucose level is tested at 2 AM, she is hypoglycemic. In addition, her plasma ketones are elevated. When she is tested early in the morning before breakfast, she is hyperglycemic. Describe the dawn phenomenon. Is Susan likely to be experiencing this? How might this be prevented?*

The dawn phenomenon results from the effect of hormones involved in controlling 24-hour rhythms. From the ours of 1 AM- 3 AM the body requires less insulin to normalize blood glucose levels compared to 4 AM to 8 AM (Krause, 703). Cortisol and growth hormones stimulate gluconeogenesis which causes hyperglycemia in the hours of 5 AM- 9 AM. The dawn effect can be similar to the rebound effect which is when there is an elevation in blood glucose as a reaction to previous low blood glucose levels during the night. Susan is likely to experience the dawn effect due to being hyperglycemic when she woke up and being hypoglycemic (Krause, 704). To correct this condition, it is recommended to have a bedtime snack or long lasting insulin regimens that need to be adjusted for Susan (Nelms, 505).

1. *What precipitating factors may lead to the complications of diabetic ketoacidosis? List these factors and describe the metabolic events that results in the signs and symptoms associated with DKA.*

Diabetic ketoacidosis (DKA) is a life threatening but reversible complication characterized by severe disturbance in carbohydrate, protein and fat metabolism (Krause, 703). In a patient who has DKA the individual will have elevated blood glucose levels of greater than 250 mg/dL and less than 600 mg/dL and there is a presence of ketones in the blood and urine. The symptoms demonstrated include polyuria, polydipsia, hyperventilation, dehydration and the fruity odor of ketones on the breath, fatigue, nausea, vomiting, stomach pain, and mental status change (Krause, 703) (Nelms, 505). The prevention methods for DKA include self-monitoring blood glucose (SMBG), testing for ketones in the urine, and further medical intervention (Krause, 703). The risk for DKA occurs an individual with type 1 DM is ill, has infection and is experiencing emotional stress such as when a patient is sick and they do not take their insulin (Nelms, 505). When an adequate amount of insulin is not available the glucose production from gluconeogenesis and lipolysis are stimulated to avoid starvation by burning fat instead of carbohydrates. Since lipolysis is activated, and a by-product of burning fat is the accumulation of ketones in the bloodstream, and osmotic diuresis occur which results in dehydration and electrolyte imbalance. When there is large amount so fluid lost the blood becomes concentrated and increases they hyperglycemia (Nelms, 505).

**II. Nutrition Assessment**

1. **Evaluation of Weight/ Body Composition**
2. *Determine Susan’s stature for age and weight for age percentiles.*

Susan is 15 years old, her current weight is 100 pounds (45.45 kg), and her height is 5’2” (157.48 cm).

BMI = wt. (kg) / ht. (cm)2

BMI = [(100 lbs. / 2.2 kg) / (62 in. x 2.54 cm)2]

BMI = 45.45 kg / (157.48 cm)2

BMI = 45.45 kg / (1.57)2

**BMI = 18.4 kg/m2**

IDB = 100 lbs. - (5 lbs. x inch. over 5 ft.)

IDB = 100 lbs. - (5 lbs. x 2 in.)

**IDB = 110 lbs.**

**IDB =** 110 lbs. / 2.2 kg = **50 kg**

Since Susan is only 15 years old it would not be appropriate to use BMI as an indicator of her weight status since she is still growing. Through based upon the calculations we can see that Susan is in the normal weight range.

When using the *Body Mass Index-for-Age Percentiles: Girls, 2 to 20 Years,* knowing that Susan is 15 years old, and followed the lined on the chart, Susan is in the 25th percentile on the growth chart for BMI and age which falls between the normal of 5th -85th percentile. Then using the *Statue-for-Age and Weight-for-Age Percentiles: Girls, 2 to 20 Years*, for Susan’s weight and age she falls in the 15th range which falls between the normal range from the 5th to 85th percentile and for her stature and age she falls in-between the 10th percentile range which falls between the normal range from the 5th to 85th percentile.

1. *Interpret these values using the appropriate growth chart.*

Based upon the CDC classification of normal weight from the growth charts Susan is in the normal weight range since she is still growing. (See above)

1. **Calculation of Nutrient Requirements**
2. *Estimate Susan’s daily energy and protein needs. Be sure to consider Susan’s age.*

EER =135.3 – (30.8 x age (yrs)) + [PA x (10 x wt (kg) +934 x ht (m))

EER = 135.3 – (30.8 x 15 yrs) + [1.51 x (10 x 45.45 kg +934 x 1.57 m)

EER = 135.3 – (462) + [1.51 x (454.5 +1466.38)

EER = 135.3 – (462) + [1.51 x (1920.88)

EER = 135.3 – (462) + 2900.52

EER= 2573.82

**EER Range = 2500- 2600 kcal**

 Protein needs- 1.0 g/kg

 1.0 g/kg x 45.45= 45 grams of protein daily

 45 grams of protein x 4 g/kcal= 180 kcal of protein

Since this is type 1 DM who is young and still growing it is important that she gets 2600 kcal per day to meet her caloric needs (Energy Needs Equations from AND, 2013). She should consume 45 grams of protein per day.

1. *What would the clinician monitor in order to determine whether or not the prescribed energy level is adequate?*

The clinician would order a 24-hour diet recall to complete a calorie count on her. Additionally, it would be important that her weight was monitored, her blood glucose was monitored and her urine to see if ketones are still present (Nelms, 481). This would allow the clinician to see if Susan is reacting well to the nutrition therapy and insulin shots that would be administer as directed depending on her consumption of carbohydrates.

1. **Intake Domain**
2. *Using a computer dietary analysis program or food composition table, calculate the kcalories, protein, fat (saturated, polyunsaturated, and monounsaturated), CHO, fiber and cholesterol content of Susan’s typical diet.*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Food** | **Serving** | **Calories** | **Fats (g)** | **Saturated Fat** | **Polyunsatu-rated Fat (g)** | **Monounsatu-rated Fat (g)** | **CHO (g)** | **Fiber (g)** | **Cholesterol (mg)** | **PRO (g)** |
| Dry Cereal that is sugar coated | 1 ½ cups  | 260 | 6 | 1 | 2 | 2 | 48  | 2 | 0 | 3 |
| 2% Milk | 1 cup | 122 | 5 | 3 | 0 | 1 | 12 | 0 | 20 | 8 |
| Orange Juice (unsweetened) | 1 cup | 122 | 0 | 0 | 0 | 0 | 29 | 1 | 0 | 2 |
| Hot chocolate  | 1 packet of mix | 113 | 1 | 1 | 0 | 0 | 24 | 1 | 0 | 2 |
| Pepperoni Pizza | 6 inch pizza | 348 | 14 | 6 | 3 | 4 | 40 | 2 | 34 | 16 |
| Mixed Salad | 1 cup | 9 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 |
| Thousand Island Dressing | ½ cup | 231 | 22 | 3 | 11 | 5 | 9 | 1 | 16 | 1 |
| Coke (regular) | 1 can (12 ounces) | 136 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 |
| Snickers candy bar | 1 bar (2 oz.) | 280 | 14 | 5 | 2 | 4 | 35 | 1 | 7 | 4 |
| White bread | 2 slices | 138 | 2 | 0 | 1 | 0 | 26 | 1 | 0 | 4 |
| Grape jelly | 1 Tbsp | 51 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| Crunchy peanut butter | 2-3 Tbsp | 237 | 21 | 3 | 6 | 10 | 7 | 2 | 0 | 10 |
| Coke (regular) | 1 can (12 ounces)  | 136 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 |
| Spaghetti noodles | 2 cups | 440 | 3 | 0 | 1 | 0 | 86 | 5 | 0 | 16 |
| Spaghetti sauce  | ½ cup | 109 | 3 | 1 | 1 | 1 | 17 | 3 | 3 | 2 |
| Ground beef | 1 ounce | 70 | 4 | 2 | 0 | 2 | 0 | 0 | 25 | 7 |
| Steamed broccoli (will eat with salt and butter but prefers **cheese sauce**) | 3 stalks | 153 | 10 | 5 | 1 | 3 | 10 | 3 | 20 | 8 |
| 2% milk | 2 cups | 244 | 10 | 6 | 0 | 3 | 23 | 0 | 39 | 16 |
| Ice Cream | 2 cups | 551 | 29 | 18 | 1 | 8 | 63 | 2 | 117 | 9 |
| Coke (regular) | 1 can (12 ounces  | 136 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 |
| **Total**  |  | 3886 kcal | 144 gram  | 54 grams  | 26 grams  | 43 grams  | 549 g. | 26 g. | 281 mg. | 110 g. |

Carbohydrates= 549 grams = 56% of calories

Proteins= 110 grams = 11% of calories

Fat= 144 grams = 33% of calories

 Saturated = 13 % of calories

 Monounsaturated= 10% of calories

 Polyunsaturated= 7% of calories

1. *What dietary assessment tools can Susan use to coordinate her eating patters with her insulin and physical activity.*

Susan can use MyPlate to track what she eats which will help her be able to see how many grams of carbohydrates she is eating and how much insulin she needs to inject. Since Susan is new to counting carbohydrates it would be best to for to learn how to carbohydrate count and learn the exchanges for the foods that she eats most often (Nelms, 501). Based upon the 2014 nutrition from the American Diabetes Association states, “evidence suggest that there is not an ideal percentage of calories from carbohydrate, protein and fat for all people with diabetes; therefore, macronutrient distribution should be based on individual assessment of current eating patterns” (Nelms, 496). Based upon Susan’s usual dietary intake it would be important to educate Susan on what she is currently eating and how important it is to take the proper amount of insulin she should have and how to administer it. I would be able to check up with her and evaluate her blood glucose levels throughout the day. A comprehensive nutrition assessment, a self-care treatment plan and the client’s health status, learning ability, readiness to change, and the current lifestyle of Susan would all help her in controlling her blood glucose from having type 1 DM (Nelms, 495). Also it would be useful to have her document her physical activity with supertracker, or a fitbit for example.

Also, eventually if Susan were to go on an insulin pump this pump would help keep track of her blood glucose constantly so before, during and after volleyball practice she would be able to monitor it to ensure she is not hypoglycemic or hyperglycemic.

1. *Dietitians must obtain and use information from all components of a nutrition assessment to develop appropriate interventions and goals that are achievable for the patient. This assessment is ongoing and continuously modified an updated throughout the nutrition therapy process. For each of the following components of an initial nutrition assessment, list at least three assessments you would perform for each component.*

|  |  |
| --- | --- |
| **Component**  | **Assessments You Would Perform**  |
| Clinical data | 1. All lab values especially blood glucose levels, urine sample and HA1C over a longer period of time2. Complete urine sample to look for ketones in urine3. Evaluation of hydration status |
| Nutrition history | 1. 24- hour diet recall2. Food journal of the times Susan is eating her meals and how she feels in-between meals 3. Who prepares the food in the household and portions meals |
| Weight history | 1. Weigh patient for current weight2. Recent changes in weight3. Weight goals of the patient  |
| Physical activity history | 1. Determine the type of physical activity, at what intensity and how much and duration2. Determine the estimated energy expenditure from physical activity3. Determine types of physical activity the client prefers or dislikes  |
| Monitoring | 1. Assess the blood glucose readings over a 3-day period when the patient is getting comfortable with the process2. Assess the patient’s comfortableness with using the glucose monitor and how to prick her finger with the needle and get a reading3. Demonstrate how to fix a situation where the patient is hyperglycemic and hypoglycemic and food items that are best to correct the problem |
| Psychosocial/ economic  | 1. Check the insurance and if the insurance the family has will cover the needs2. Offer support groups that the patient and family can attend if necessary for coping3. Assess the social support from the family  |
| Knowledge and skills level | 1. Assess patient’s ability to read a food label and understand its meaning and point out the key importance of carbohydrates2. Complete exercises for patient to practice carbohydrate counting the amount of insulin that would injected 3. Provide the family members information they are able to read up on or how to find additional resources  |
| Expectations and readiness to change | 1. Assess the patient’s feelings about the recent diagnosis on the readiness to change continuum 2. Assess the patient’s questions they have about type 1 DM, insulin, carbohydrate counting or anything else3. Follow up with the patient and family to ensure they are adjusting well to the change |

1. **Clinical Domain**
2. *Does Susan have any laboratory results that support her diagnosis?*

The main laboratory results that support’s Susan’s diagnosis include her glucose level of 250 mg/dL (normal range of 70-110 mg/dL), which shows her cells are not taking the glucose that she is ingesting. A blood glucose of greater than 200 mg/dL is one of the criteria for the diagnosis of type 1 DM (Nelms, 481). Also the other key lab value to look at is her HbA1C which is 7.95% (normal range from 3.9- 5.2%), which indicates that over a long period of time she has had elevated blood glucose levels. Another criterion for type 1 DM is an HbA1C great than 6.5% (Nelms, 481). Both of these two lab values support Susan’s diagnosis of type 1 DM.

1. *Why did Dr. Green order a lipid profile?*

Dr. Green ordered a lipid profile because he may have been interesting in evaluating her lipid lab values in comparison to her glucose control. In a study completed by the American Diabetes Associates about proper Diabetes Care, the study examined the lipid profile in youth with type 1 DM compared to no diabetes. Through this study it was shown that youth with type 1 DM and have optimal HA1C have better lipid lab values when comparing total cholesterol, LDL cholesterol and LDL particle size (ADA, 2008). Additionally, specific factors of your lifestyle, physical activity level, level of diabetes control and smoking status can all affect one’s cholesterol, triglycerides and HDL (ADA, 2008). It is important for diabetics to monitor their lipids and blood pressure to ensure they are within the normal range (Nelms, 504).

1. *Evaluate Susan’s laboratory values:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chemistry** | **Normal Value** | **Susan’s Value** | **Reason for Abnormality** | **Nutritional Implications**  |
| Pre-albumin | 16-35 mg/ dL | 40 mg/dL | Dietary intake and decreased amino acid uptake by cells.  | Patient is losing muscle mass and protein is not being used as an energy source and instead burning fat.  |
| Osmolality | 285-295 mmol/kg/H2O | 304 mmol/kg/H2O | Experiencing dehydration due to frequent urination. | The patient has a fluid imbalance, also indicated by the frequent urination. |
| Glucose | 70-100 mg/dL | 250 mg/dL | Decrease glucose uptake by cells because the pancreas is no longer working.  | This suggests the patient is having an issue with insulin resistance or production and suggests diabetes due to high levels blood glucose in the blood. |
| BUN (blood urea nitrogen) | 8-18 mg/dL | 20 mg/dL | Kidney may not be functioning properly due the amount of glucose the it process and can be in negative nitrogen balance.  | The patient is dehydrated due to frequent urination.  |
| HbA1C | 3.9-5.2 % | 7.95% | High glucose level in the blood for an extended period of time for at least 2-3 months. | This is key indication of type 1 DM due to prolonged time for the body to not be effectively using energy consumed.  |

1. *Compare the pharmacological differences in insulins:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of Insulin** | **Brand Name** | **Onset of Action** | **Peak of Action** | **Duration of Action** |
| Lispro | Humalog | <15 minutes | 1-2 hours | 3-5 hours |
| Aspart | NovoLong | < 15 minutes | 1-2 hours | 3-5 hours |
| Glulisine | Apidra | <15 minutes | 1-2 hours | 3-5 hours |
| NPH | Humulin N | 2-4 hours | 4-10 hours | 10-16 hours |
| Glargine | Lantus | 2-4 hours | Peakless | 20-24 hours |
| Detemir  | Levemir | 2-4 hours | Peakless | 18-24 hours  |
| 70/30 premix | 70/30 | 0.5 to 1 hour | Dual | 10-16 hours |
| 50/50 premix | Humalog Mix 50/50 | <15 minutes | Dual | 10-16 hours |
| 60/40 premix  | Novolin 60/40 | 30 minutes | Dual  | 18-24 hours  |

(Krause, 692)

1. *Once Susan’s blood glucose levels were under control, Dr. Green prescribed the following insulin regimen: 24 units of glargine in PM with the other 24 units as lispro divided between meals and snacks. How did Dr. Green arrive at this dosage?*

Dr. Green arrived at this specific dosage of insulin for Susan based on Lispro being a rapid- acting insulin and glargine being a long-lasting insulin (Krause, 691). Rapid-acting insulin is slightly different to human insulin but bind to insulin receptors. This type of insulin is used throughout the day when the patient would be eating or exercising and in Susan’s case playing volleyball. Rapid-acting insulin have an onset time of 15 minutes and peak within 60- 90 minutes and last for 3-5 hours (Krause, 691). Rapid-acting insulin can be divided up throughout the day depending on what Susan is eating based on the number of carbohydrates. Long-lasting insulin is an insulin that results in a relatively constant and peakless deliver over 24 hours because of the slow dissolution at the injection site (Krause, 691). This type of insulin is normally given at bed time to help keep the blood glucose level while the individual is sleeping and control her dawn phenomenon. The dosage amount of insulin is determined for normal-weight persons with type 1 DM and have a dosage of 0.5-1 unit/ kg of body weight per day. Since Susan is 100 pounds which is 45.45 kg, it would be appropriate that she is receiving 48 units of insulin per day (Krause, 693).

45.45 kg of body weight/ 48 units of insulin= 1.05 units/ kg

Based upon this the doctor would have multiplied 45.45 kg x 0.95 units = 48 units of insulin

1. **Behavioral- Environmental Domain**
2. *Identify at least three specific potential nutrition problems with this domain that will need to be addressed for Susan and her family.*
* The first specific potential nutrition problem that will need to be addressed is how to address nutrition in relation to Susan’s diabetes. It is extremely important for Susan to maintain her blood glucose levels in the proper range of 70-100 mg/dL throughout the day and it is important for the family to know how to correct her blood sugars incase there is an issue such as being hyperglycemic or hypoglycemic.
* Secondly it is important to learn how to read a nutrition label and look at the number of carbohydrates, in Susan’s case. Since a nutrition label is not always available it is important for Susan to learn the basic carbohydrate exchanges. Also I think another important thing to stress with the family when learning all this material, is that even though this will take some time getting used to, Susan should not feel restricted or feel that she can not do or eat what everyone else is eating, it just means she needs to be a little more careful monitoring her blood glucose levels and count her carbohydrates.
* Another important thing that Susan and her family need to address is keeping a diet log and especially a blood glucose log. Especially starting out with Susan getting used to testing her blood glucose levels she needs to understand the importance of not letting her blood glucose get too far out of range. By logging her blood glucose she is able to see the changes and fluctuations that are occurring.
1. *Just before Susan is discharger, her mother asks you, “My friend who owns a health food store told me that Susan should use stevia instead of artificial sweeteners or sugar. What do you think?” What will you tell Susan and her mother?*

I would explain to Susan’s mother that this is a common misconception about stevia, artificial sweetener and sugar so this is a great question to ask. Stevia is from the stevia plant also called Reb-A and is several hundred times sweeter than sugar. According to the FDA Reb-A is not one of the six artificial sweeteners, but the FDA has said it is generally recognized as safe to consume (ADA, 2014). In general, most artificial sweeteners such as stevia do not raise blood glucose levels because they are not made of carbohydrates (Mayo Clinic, 2015). In general stevia is a safe product to use, but it would be recommended to use it in small amounts due to its intense sweetness.

1. **Nutrition Diagnosis**
2. *Select two highly-priority nutrition problems and complete the PES statement for each.*
* Food- and nutrition-related knowledge deficit (NB-1.1) related to newly diagnosis of type 1 diabetes mellitus as evidence by blood glucose of 250 mg/dL and HA1C of 7.95.
* Excessive energy intake (NI-1.3) related to over consumption of calories based on patient’s usual intake as evidence by consumption of 3886 kcal in her usual diet recall.

**III. Nutrition Intervention**

1. *For each of the PES statements that you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).*
* Food- and nutrition-related knowledge deficit (NB-1.1) related to newly diagnosis of type 1 diabetes mellitus as evidence by blood glucose of 250 mg/dL and HA1C of 7.95.
	+ The ideal goal would be to educate Susan and her family on carbohydrate counting for her new diagnosis of type 1 DM. The intervention technique that would be used is educating the family with practice examples, reading a label and how to administer the proper amount of insulin with the specific amount of carbohydrate she is consuming.
* Excessive energy intake (NI-1.3) related to over consumption of calories based on patient’s usual intake as evidence by consumption of 3886 kcal.
* The ideal goal be to decrease Susan’s caloric intake to 2600 calories per day. To be able for Susan to understand how she is able to do this, I would discuss with her more nutrient dense snacks she can have instead of 2 cups of ice-cream have ½ cup of ice-cream and trying to cut the 4 coca- cola sodas out of her diet and substitute it with water. I would suggest for Susan to utilize my plate or an app to track her calories per day.
1. *Does the current diet order meet Susan’s overall nutritional needs? If yes, explain why it is appropriate. If no, what would you recommend? Justify your answer.*

The current diet order for Susan is 2,400 kcal which is 300 grams of carbohydrate, 55-65 grams of protein, and 80 grams of lipid. With the current diet order there would be 1300 kcal of carbohydrates (54% total calories from carbohydrates), 220- 260 kcal of protein (9-10% total calories from protein) and 720 kcal of lipid (30% of the total calories from lipids). Based upon the calculations of Susan’s normal diet it has the same distribution of carbohydrates of 56%, protein 11% and fat 33%. This would be an appropriate appropriate diet order as the EER was 2600 kcal per day, which is just slightly less. Based upon the 2014 nutrition from the American Diabetes Association states, “evidence suggest that there is not an ideal percentage of calories from carbohydrate, protein and fat for all people with diabetes; therefore, macronutrient distribution should be based on individual assessment of current eating patterns” (Nelms, 496). Therefore, I think this is the correct diet order to meet Susan’s overall nutritional needs.

**IV. Nutrition Monitoring and Evaluation**

1. *Susan is discharged Friday morning. She and her family have received information on insulin administration, SMBG, urine ketones, recordkeeping, exercise, signs, symptoms, and Tx of hypo-/hyperglycemia, meal planning (CHO counting), and contraception. Susan and her parents verbalize understanding of the instructions and have no further questions at this time. They are instructed to return in 2 weeks for appointments with the outpatient dietitian and CDE. When you come in to work Monday morning, you see that Susan was admitted through the ER Saturday night with a BG of 40 mg/ dL. You see her when you make rounds and review her chart. During the interview, Susan tells you she was invited to a party Saturday night after her discharge on Friday. She tested her blood glucose before going to the party, and is measured 95 mg/dL. She took 2 units of insulin and knew she needed to have a snack that contained approximately 15 grams of CHO, so she drank one beer when she arrived at the party. She remembers getting lightheaded and then woke up in the ER. What happened to Susan physiologically?*

When Susan first tested her blood glucose when it was 95 mg/dL this indicated that it was in the appropriate range. According to the American Diabetes Association it is important that for individuals who are drinking alcohol, that they do not use alcohol to replace the normal food, or in Susan’s case, snack that she should have had after she administered the insulin (ADA, 2013). What happened to Susan’s body is it went hypoglycemic, demonstrated from her symptoms of feeling lightheaded. Both hypoglycemia and consuming too much alcohol can have similar symptoms including sleepiness, dizziness, and disorientation (ADA, 2013). When a diabetic drinks it is dangerous because the person’s liver has to work extra hard by removing the alcohol from the blood and then additionally regulate the blood sugar. Also when consuming a mixed drink with soda or juice, which are very high in carbohydrates, I would suggest staying away from these drinks because this could spike her blood glucose levels (ADA, 2013).

1. *What kind of educational information will you give her before this discharge? Keep in mind that she is underage for legal consumption of alcohol.*

One of most important things for Susan that although she is underage for drinking, it will happen, especially since it did the day after she got out of the hospital. I would not encourage drinking, but I would give Susan and her parents the important knowledge and how to drink appropriately with type 1 DM. Some of the tips that I would give her is that it is important to not replace an alcoholic beverage for regular food (ADA, 2013). I would suggest that if Susan does decide to drink that she should always keep a zero calorie beverage with her such as water so she is able to keep herself hydrated while drinking (ADA, 2013). The next thing I would suggest is that she may want to try to stay away from heavy craft beers, and instead have light beer or a wine spritzer with club soda. Susan needs to remember that in a mixed drink for example such as a Coca-Cola or fruit juice, these are very high in carbohydrates which can cause Susan’s to be hypoglycemic. Alcohol can cause Susan to become hypoglycemic shortly after drinking and up to 24 hours. It is important for her to check her blood glucose before drinking and before going to bed, and if it low, have a small snack before bed. Another tip I would suggest for Susan is for her to pack snacks in her purse, so she can prevent becoming hypoglycemic when and if she decides to drink again in the future.

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