Use of Visual Cueing for Blood Glucose Documentation in a Person with Schizophrenia and Diabetes

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Abstract

Persons diagnosed with schizophrenia are also at-risk for medical comorbidities. We present the case of one such patient with the comorbidity of diabetes. By applying the research on visual cueing for this population, we developed a glucose monitoring form that increased documentation. We encourage other healthcare practitioners to develop visually appealing or interesting documentation forms for their patients to help empower them for self-care.

Key Words: Diabetes, Glucose, Schizophrenia

Introduction

A diagnosis of schizophrenia is associated with a two- to three-fold increase in mortality (1). In addition to lifestyle choices (2-4) and barriers to healthcare (5, 6), the prevalence of a number of comorbid medical conditions has been theorized to increase the mortality rates for this population. Diabetes is of particular interest (7). While psychotic symptoms may contribute to deficits in the patient's ability to perform self-care behaviors (8), visual information processing is also impaired in persons diagnosed with schizophrenia (9). We present a case report of a patient with comorbidities of schizophrenia and diabetes, type 1, who increased diabetes self-care monitoring following the implementation of a color-coded glucose monitoring log.

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Case Report

SJ is a 25-year-old African-American man referred to an integrated multidisciplinary program of assertive community treatment after numerous visits to local crisis units and multiple admissions for inpatient treatment, for both psychiatric and medical problems. The patient is a poor historian. Fund of knowledge is limited. Past psychiatric history is significant for a diagnosis of schizophrenia, undifferentiated, at age twenty years. Additional diagnoses include tardive dyskinesia, depressive disorder not otherwise specified, and panic disorder with agoraphobia. The age at which diabetes was diagnosed is not known. Pharmacotherapy includes paliperidone palmitate 234 mg every four weeks via intramuscular injection, citalopram 40 mg orally daily, aspirin 81 mg orally daily, diphenhydramine 50 mg orally twice daily, insulin aspart, recombinant 14 units subcutaneously (SC) three times daily, before each meal, and insulin glargine 33 units at bedtime. The patient is single, lives alone in supported housing for those with mental illnesses, and receives disability secondary to his mental illness. Social history is positive for tobacco use (smokes one pack cigarettes daily). He denies use of other drugs or alcohol. He left formal education prior to completion of high school.

Staff provides support three times weekly. They are not always able to review the glucose monitoring log during the

visits. However, contact reports indicate glucose readings have been in the 400s (normal range 65–99 mg/dL). Daily readings, when available, have ranged from the 90s to the low 100s. Long-term control results are consistent with the daily readings. Glycosylated hemoglobin (A1c) results have been as high as 10.2% (goal for a person with diabetes: 6.5%), corresponding to an average daily glucose of 246 mg/dL. At the time of the most recent physical exam, vital signs were within normal limits (blood pressure 98/56, pulse 84 beats/minute, respiration 12/minute) with a weight of 163 pounds (74 kg), height 70 inches. Some lipid panel values were out of range: total cholesterol 121 (range 125–200 mg/dL), HDL 38 (range ≥40 mg/dL), triglycerides 54 (range <150 mg/dL), LDL 72 (range <130 mg/dL). Fasting glucose was 248 mg/dL.

The patient expressed interest in using a different glucose monitoring log. One was developed that incorporated information from visual cueing for persons with schizophrenia and a simpler design. A six-week pilot program was undertaken to determine if the new design was easier for the patient. The patient was in-serviced on the new log. Input and feedback were elicited through open-ended questions (e.g., what do you like about the form?) throughout the trial period. Positive reinforcement was provided during the visits three times a week.

Following the six-week pilot program, documentation completion averaged 64.3% (range 7.1 to 90.5%) for the insulin given and 70.3% (range 14.3 to 90.5%) for the blood glucose readings. The patient reported he was able to locate the form, take a blood glucose reading, and record the dose of insulin used on a regular basis. Morning rates were lowest due to patient-specific variables. The patient prefers to stay up late at night, often into the early morning hours, and sleep late. He also reports that he does not eat breakfast if up early enough to use the residential dining room. He does have a small kitchen area in his apartment. He declines to cook for himself. He has been encouraged to maintain a supply of readily available food.

Discussion

Deficits in executive functioning are associated with a diagnosis of schizophrenia (10). Schizophrenia is considered a heterogeneous disorder. However, these deficits vary from person to person. With regards to attention, a determination of which specific aspect of attention—and if impairment is a function of a specific subgroup or symptom domain—has not been identified (9).

Visual Cueing and Schizophrenia

Persons who have experienced the deficits associated with a diagnosis of schizophrenia respond to visual stimuli differently compared to the general population. When faced with numerous distracting stimuli, this population will focus their observations on central position cues (11). Studies show that when a person with schizophrenia is presented with a total number of fixed items (whether via physical form or on paper) his reaction time depends on the relative frequency of specific distracters. Researchers found that the patient will respond better when there are fewer distracters presented within a display (12). Additional work in this area found faulty information processing represents one of the executive function domain problems recognized with a diagnosis of schizophrenia. Initial research sought to construct experimental tasks that could be replicated, identify specific attentional processes, and connect these areas to identifiable neural pathways (13). Nestor and colleagues demonstrated visual cues enhanced reaction time (13).

Response to color was one measure reported by Scherer and Storms (11). Five groups were involved: four groups with diagnoses of schizophrenia (n=10 each group, long- and short-term schizophrenia with and without paranoia; one control group n=10). Individuals in the subgroups without paranoia could not differentiate color. In addition, the ability to attend to this variable (color) decreased the tasks requiring attention (11).

The effects of distracters were evaluated by Elahipanah and colleagues (12). The researchers sought to determine if persons with a diagnosis of schizophrenia or schizoaffective disorder (n=23) could select the stimulus with the most information and group search terms based on perceptual features compared to a control group (n=22). Both groups were efficient and able to group searches based on color or shape and shift attention to the smaller subset. The difference between the groups—as a function of response time—was found when the number of same-shape distracters was 50% (24 of 48) for the total number (12).

Blood Glucose Log Design

The design of the log was based on these research findings. We minimized the number of distracters and started the log the day the patient received his other medications and individualized home-based services from the team. We included specific cueing information, specifically a header with directions for use, the date, weekday, dose, and type of insulin. Rather than condense the form to one page for the month (see Log 1), we expanded the form to include more white space, enlarged the font (from 8 to 12 points) and simplified it with straighter lines (Times New Roman to Calibri). Each utilization point was identified, with a space for the dose of insulin used and the blood glucose/sugar reading associated with that time.

The use of color was added to facilitate visual cueing.

Table 1 Blood Glucose Monitoring Completion Rates

Monitoring Point	Breakfast	Lunch	Dinner	Bedtime
Insulin Injections Recorded; Total Trials Available=42	3	32	38	35
Insulin Injection Completion Rate (%)	7.1	76.2	90.5	83.3
Blood Glucose Readings Recorded; Total Trials Available=42	6	36	38	38
Blood Glucose Reading Completion Rate (%)	14.3	85.7	90.5	90.5

Insulin was grouped by type. The lighter or day color was used to represent the daytime regimen, and the basal insulin— administered at bedtime—was represented by the darker or evening color (see Log 2).

Using this theory, we minimized the number of distracters included in the insulin and blood glucose log sheet (see Logs 1 and 2) and started the log the day the patient received his other medications and individualized services from the team. Previously, the patient had to record the day of the week and date and, for that specific day of the entire month, record the time of the day for the activity and reading (see Log 2). We theorized the patient was unable to differentiate, as all days looked identical. We simplified the log sheet from monthly monitoring to weekly. To avoid confusion of color hue recognition, we chose two colors that are opposites on the color spectrum (orange and blue). We piloted a six-week program to determine if these changes would help the patient focus on one week at a time while using visual color cues as a guide to use of the correct insulin and time of day.

Monitoring Results

The patient is a poor historian and cannot recall the timing of the most recent meal. This resulted in some of the glucose readings extending to the 400s for the high readings and in the 90s to low 100s for the daily low readings (normal range 65–99 mg/dL). Glycosylated hemoglobin (A1c) results were high (10.2%, goal for a diabetic=6.5%). The form was piloted for six weeks following a patient in-service. When the new form was evaluated, documentation completion averaged 64.3% (range 7.1 to 90.5%) for the insulin given and 70.3% (range 14.3 to 90.5%) for the blood glucose readings (see Table 1). The patient reported he was able to locate the form, take a blood glucose reading, and record the information more consistently.

Conclusions

Persons diagnosed with schizophrenia are also at-risk for medical comorbidities. We present the case of one such patient with the comorbidity of diabetes. By applying the research on visual cueing for this population, we developed a glucose monitoring form that increased documentation. We encourage other healthcare practitioners to develop visually appealing or interesting documentation forms for their patients to help empower them for self-care.

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Monitoring Log 1: Monthly Blood Glucose Log

		Breakfast		Lunch		Dinner		Bedtime	
Day	Date	Time	Blood Glucose	Time	Blood Glucose	Time	Blood Glucose	Time	Blood Glucose

Monitoring Log 2: Weekly Color Cueing Blood Glucose Log

		Breakfast	Lunch	Dinner		Bedtime
Monday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Tuesday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Wednesday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Thursday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Friday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Saturday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =
Sunday	Insulin Aspart, Recombinant*	Injection =	Injection =	Injection =	Insulin Glargine†	Injection =
		Blood Sugar =	Blood Sugar =	Blood Sugar =		Blood Sugar =

*Insulin Aspart, Recombinant (prefilled pen): Use **5–10 min before** meal, †Insulin Glargine (prefilled pen): Use **when you go to bed** at night.