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Depression, deficits in functional capacity, and impaired glycemic control in urban African Americans with type 2 diabetes

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ABSTRACT

Background: Effective depression treatment does not reliably reduce glycosylated hemoglobin (HbA1c) in depressed patients with type 2 diabetes, possibly in part due to deficits in functional capacity, i.e. performance of certain everyday living skills, essential for effective diabetes self-management. We sought to determine: a) the magnitude of deficits in functional capacity among urban, African American (AA) patients with type 2 diabetes, and b) whether these deficits were associated with poorer glycemic control.

Methods: At their initial visit to an inner-city diabetes clinic, 172 AA patients with type 2 diabetes were assessed with a variety of instruments, including the Mini International Neuropsychiatric Interview (MINI) and the UCSD Performance Skills Assessment-Brief (UPSA-B). They then entered a comprehensive diabetes management intervention, whose success was indexed by HbA1c levels at up to four reassessments over a one-year period. A mixed-effects model repeated-measures method was used to predict HbA1c.

Results: The prevalence of depression was 19%; the mean UPSA-B score was 81 ± 17. After multivariate adjustment, increased HbA1c levels over time were predicted by the presence of major depression ($B = .911$, $p = .002$) and decreasing (worse) scores on the UPSA-B ($B = -.016$, $p = .027$), respectively. Further adjustment for increasing the dosage of oral or insulin during the treatment eliminated the association between the UPSA score and HbA1c level ($B = -.010$, $p = .115$).

Conclusions: Depression, as well as deficits in functional capacity, predicted reduced effectiveness of a diabetes self-management intervention. Future studies will determine whether interventions targeted at both improve glycemic control.

1. Introduction

African-Americans (AA) suffer from an increased prevalence of type 2 diabetes (Centers for Disease Control, 1993), and comorbid depression (Gary et al., 2000; Gilles et al., 2006). Irrespective of race, the presence of depression in patients with type 2 diabetes has been associated with acceleration of cognitive decline (Sullivan et al., 2013) as well as poorer compliance with medications which can potentially slow cognitive decline, i.e. antihypertensive drugs (Poon, 2008), aspirin (Kern et al., 2012), and statins (Steenland et al., 2013). Furthermore, in patients with diabetes, neurocognitive function can be impaired by agents with anticholinergic effect (Campbell et al., 2010): prescribed for neuropathic pain (e.g. amitriptyline), hypertension (e.g. atenolol). Less well examined are the consequences of neurocognitive deficits upon adherence to often complex diabetes treatment regimens (Awad et al., 2004; Kodl and Seaquist, 2008). Nevertheless, a rapidly accumulating database indicates that neurocognitive deficits correlate strongly with deficits in functional capacity (Moore et al., 2007), that is, the inability to perform critical daily skills, such as communication, manage medications, and handle finances ($r = .60–.65$) (Leifker

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et al., 2011), in patients ranging from those with HIV infection (Heaton et al., 2004) to Alzheimer's disease (Gomar et al., 2011), or schizophrenia (Light et al., 2012; Keefe et al., 2011), as well as older healthy individuals (Leifker et al., 2011). Indeed, deficits in functional skills, when quantified in the laboratory, also predict "real world" outcome, i.e. the capability of patients with schizophrenia and bipolar disorder to live independently and sustain employment (Auslander et al., 2001; Mausbach et al., 2011; Twamley et al., 2002; Bowie et al., 2008, 2010). Of note is that functional capacity has not been previously examined in patients with type 2 diabetes, nor has its impact on their disease self-management, as reflected by another "real world" measurement, HbA1c. Though other psychiatric comorbidities such as anxiety and addictive disorders are common in patients with type 2 diabetes, depression may be most prevalent (Gilles et al., 2006). Thus, we sought to determine among urban, AA patients with type 2 diabetes: a) the prevalence and magnitude of depression, b) as well as deficits in functional capacity, and then c) examine whether depression, or difficulties in performing critical functional skills "in the lab", would be associated with magnitude of HbA1c at up to one year of follow-up.

2. Method

2.1. Participants

The Grady Health System Diabetes Clinic population is predominantly African American, with high rates of retinopathy, nephropathy, poverty and poor functional health literacy (Cook et al., 1999). Fewer than 10% of newly presenting patients have commercial health insurance; approximately 50% have no third party health care coverage (Ziemer et al., 1996). Patients may self-refer or be referred from their primary care or other specialty providers for treatment. Those diagnosed with type 2 diabetes fulfill American Diabetes Association (ADA) guidelines (The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003): symptoms of diabetes (polyuria, polydipsia, unexplained weight loss) and a plasma glucose concentration $\geq$ 200 mg/dl, or a fasting plasma glucose of $\geq$ 126 mg/dl, or a 2-hour plasma concentration $\geq$ 200 mg/dl during an oral glucose tolerance test using an equivalent of 75 g anhydrous glucose dissolved in water.

2.2. Study design

This prospective study was a sub-study of a larger, longitudinal, prospective examination of depression and glycemic control in urban African Americans with type 2 diabetes. Patients new to the Clinic were evaluated during a comprehensive intake appointment, including a medical history, physical exam, retinal photographs, and laboratory testing. Patients fulfilling study inclusion criteria (African American, English speaking, medical confirmation of diabetes, age 18–80 years, and to initiate diabetes care in the Clinic) were offered participation in the parent study beginning January 1, 2004 and ending March 30th, 2008. The convenience sample of the sub-study was recruited from August 2007 to March 2008. African-American ancestry was confirmed through self-report. This study was approved by the Emory University Institutional Review Board and the Grady Research Oversight Committee. Written informed consent was obtained.

2.3. Study assessment

After providing consent, the 30–45 min diagnostic psychiatric evaluation was administered only once, during the 6–8 h initial clinic visit at the Clinic.

The psychiatric diagnostic evaluation included the Mini International Neuropsychiatric Interview (MINI), a brief, structured, observer-administered questionnaire surveying for the presence of psychiatric disorders classified according to DSM-IV during the prior 12 months (Sheehan et al., 2005); magnitude of depressive symptoms were assessed using the 20-item, dimensional, self-report Zung Depression Rating Scale (Zung, 1965). Another dimensional screening tool, the Traumatic Events Interview (TEI) (Schwartz et al., 2005), was used to detect past episodes of trauma and early life stress (ELS), defined by physical or sexual abuse at the age of 13 or younger. Participants received $15 compensation for the diagnostic evaluation. Those who wished to participate in the sub-study, received another $15 compensation to undergo the 15-min functional capacity assessment consisting of the University of California San Diego Performance Skills Assessment-Brief (UPSA-B) (Sheehan et al., 2005; Mausbach et al., 2007), a performance-based, laboratory assessment of financial (i.e. make change and write a check to pay a bill) and communication (i.e. use a telephone to change a medical appointment) skills, with demonstrated validity regarding concurrent residential status and community engagement in persons with psychotic disorders (Mausbach et al., 2009). The psychometric properties of the UPSA-B have been examined, comparing healthy controls (n = 109; mean age 68 $\pm$ 12; mean UPSA-B score: 85 $\pm$ 9) vs. patients with schizophrenia (n = 238; mean age 57 $\pm$ 9; mean UPSA-B score: 69 $\pm$ 20), yielding a test-retest reliability of the UPSA-B for that sample of patients of .75 and .73 at 18- and 36-months, respectively (Leifker et al., 2010). Sociodemographic and diabetes-related characteristics were obtained from patient self-report, the Grady Diabetes Clinic Patient Tracking System (DPTS), and the Grady Pharmacy database, including duration of diabetes, type of hypoglycemic treatment, and level of HbA1c. Prescription of medications for comorbid medical disorders was measured using the well-validated Chronic Disease Score (CDS) method by Von Korff and colleagues (Clark et al., 1995) in order to index general burden of illness. Information regarding income was gleaned from the Grady Health System electronic database.

2.4. Referral for depression treatment

Patients who fulfilled diagnostic criteria for major depressive disorder were informed of their diagnosis, and received referral in verbal and/or written form for treatment within the Grady Healthcare System, their local mental health center, and other community resources.

2.5. Diabetes Management Education Intervention

Patients were then scheduled return appointments to the Grady Diabetes Clinic every three months for their diabetes treatment involving the Diabetes Management Education Intervention: three educational classes, two designed to give information on diabetes, and another focused on diet and nutrition (Ziemer et al., 1996). Combined, the classes provided 5–6 h of diabetes education and were taught by either a certified diabetes educator or a dietician. Topics included the signs and symptoms of hypo- and hyperglycemia, the "ABCs" of diabetes, including what a HbA1c is and its importance, support group resources, and the importance of ADA goals and goal setting, the importance of self-management activities including medication compliance, nutrition and diet, physical exercise, stress management, how to perform the blood glucose test, maintenance of personal logs tracking glucose levels and other important medical indices, and recognition of patterns of their glucose levels. Clinic patients were given the opportunity to ask questions during sessions and were administered pre-, and