

Barriers to Achieving Glycemic Targets: Who Omits Insulin and Why?

Improved glycemic control in people with diabetes delays the onset and progression of severe microvascular complications of diabetes (1,2). Despite advances in pharmacotherapy and diabetes treatment devices and the emphasis placed on treatment adherence over the last decade, National Health and Nutrition Examination Survey (NHANES) data showed 45% of patients with diabetes did not achieve glycemic targets of <7% (3). Although some patients with diabetes may be undertreated (e.g., inappropriate treatment regimens, psychosocial issues that require adjustment in therapeutic targets), one reason for poor glycemic control is patients' difficulty in following treatment prescriptions and recommendations for diabetes self-care.

The number of diabetes medications prescribed and the number of people using diabetes medications have increased exponentially as a result of increasing prevalence rates in type 2 diabetes. Insulin is an extremely effective glucose-lowering treatment that is a medical requirement for type 2 diabetes when the pancreas fails. Approximately 27% of all people with diabetes take insulin (4). Surprisingly little is known about factors related to adherence to medication prescriptions and, more specifically, intentional insulin omission and how underlying motivations for insulin omission differ by type of diabetes.

A recent study in this issue of *Diabetes Care* by Peyrot et al. (5) brings this issue to the forefront. The purpose of this study was to explore the frequency of intentional insulin omission and the factors associated with this behavior in a sample of 502 U.S. adults self-identified as taking insulin by injection to treat either type 1 or type 2 diabetes. Fifty-seven percent of the respondents reported omitting insulin injections, with 20% omitting insulin injections regularly. Regression analyses identified older age, lower income and education, type 2 diabetes, poor diet adherence, more frequently prescribed injections, interference with daily activities, pain, and embarrassment as independent risk factors for intentional insulin omission. Separate analyses for respondents

with type 1 diabetes and those with type 2 diabetes found diet adherence to be a more prominent correlate among type 1 respondents, whereas age, education, income, pain, and embarrassment were more prominent among type 2 respondents. Although patient respondents were self-selected and the sample was relatively small to determine the national prevalence of intentional omission of insulin doses, the findings suggest that insulin omission is a substantial problem in the clinical care of diabetes. Peyrot et al. also recommend strategies for addressing these risk factors to prevent intentional insulin omission, which can inform clinical practice.

The Peyrot study results are consistent with prior research finding that patients with type 2 diabetes have relatively low levels of adherence to insulin estimated to range from ~59% for those in poor glycemic control to 77% for those in better control (6–8). One danger is that physicians treating patients with low adherence may prescribe higher doses of insulin to control glucose levels, which may further escalate the problem and may place the patient at risk of hypoglycemia when injections are actually taken. Poor insulin adherence is a significant problem for health care delivery. Patients may be more likely to adhere to their treatment if they believe it alleviates their diabetes symptoms (9). Providers should address patients' perceptions of the benefits of adhering to their treatment.

The point at which insulin treatment should be initiated for those diagnosed with type 2 diabetes is under debate with one new study advocating that an insulin-metformin treatment regimen be considered in patients newly diagnosed with type 2 diabetes (10). This study found that an insulin-metformin regimen was effective in newly diagnosed type 2 diabetic patients without causing increased weight gain or hypoglycemia when compared to a metformin regimen (10). Others suggest that early insulin therapy may protect against β -cell function decline (11–13). Moreover, the American Diabetes Association and the European Association for the Study of Diabetes rec-

ommend the early addition of insulin therapy for patients not achieving treatment goals (14). The finding by Peyrot et al. that pain and embarrassment influence insulin omission suggests that alternate delivery systems such as an insulin pen system and better preparation for starting insulin may be useful for improving how individuals with type 2 diabetes take insulin.

However, many physicians and patients are resistant to initiate insulin therapy with higher rates of physicians delaying insulin therapy in the U.S. compared with other countries (15). Moreover, U.S. patients hold beliefs of lower insulin efficacy and higher self-blame/perceived failure for requiring insulin (15,16). Physicians need to identify and address patients' beliefs about insulin and examine their own reluctance to initiate insulin treatment. Addressing type 2 diabetic patients' concerns about insulin early in the treatment may help minimize or prevent psychological insulin resistance and insulin omission. This important area needs additional study.

The Diabetes Control and Complications Trial (DCCT) found that improved glycemia with intensive insulin treatment was associated with weight gain (17). Much of the work thus far on insulin omission has studied patients with type 1 diabetes, with emphasis on insulin omission as a dangerous symptom among women with disordered eating issues (18). Insulin omission is relatively common, occurring in 31% of a sample of 341 women aged 13–60 years with type 1 diabetes; 8.8% of that sample reported frequent omission (19) and 28% in a younger sample of type 1 patients (20). Insulin omission is associated with disordered eating, psychological distress, fear of hypoglycemia, and general regimen nonadherence (19). It results in poorer glycemic control, increased rates of acute and chronic complications, hospital admissions for ketoacidosis, increased risk for mortality, and shortened life span (18,20).

The connection between type 1 diabetes and eating disorders is of concern as these are associated with poor glycemic

control, frequent episodes of ketoacidosis, and more frequent emergency room and hospital visits (21–23). A well-controlled study found that DSM-IV criteria eating disorders were more than twice as prevalent in female subjects with type 1 diabetes compared with age-matched control subjects (24). Restriction or omission of insulin may be an important symptom of a concurrent eating disorder; however, other issues may also drive insulin omission although usually not to the extent found when associated with disordered eating. The complexity of the two conditions requires frequent medical and psychiatric monitoring.

The term *diabulimia*, which is becoming common in the popular press, is a misnomer that may lead to the minimization of two very serious illnesses, eating disorders and type 1 diabetes, which, when comorbid, can lead to serious consequences of increased morbidity and mortality. This term is best avoided as it is not an official diagnosis. Importantly, Peyrot et al. show that not all insulin omission is motivated by weight issues, and they suggest that the assessment of attitudes and beliefs about insulin is important to improve glycemia and diabetes self-management.

The association of insulin omission and weight may be different among those with type 2 diabetes. In the Diabetes Attitudes, Wishes and Needs (DAWN) study, 25% of adults with type 1 or type 2 diabetes reported worrying about their body weight (25). Weight concerns were associated with being female, less educated, diagnosis of type 2 diabetes, having more comorbidities, shorter duration of diabetes, and reported weight gain with diabetes. Weight concerns were also associated with worry about both starting insulin and having hypoglycemia. Whether weight concerns are precursors of resistance to starting insulin treatment or precursors of intentional insulin omission once prescribed is not clear and requires further study (15). Further, whether type 2 diabetic patients perceive insulin treatment as causing weight gain or insulin omission as causing weight loss is not completely clear. Studying such perceptions is important for better understanding type 2 diabetic patients' avoidance of insulin treatment.

Two additional issues raised by Peyrot et al. are the impact of depression and ethnicity/race. Approximately 10–15% of patients with diabetes suffer from comor-

bid major depression (26,27), and diabetes nonadherence is further complicated by depression (27,28). Depression increases the risk of poor health outcomes including diabetes complications (29) and hyperglycemia (30) and leads to poor self-care behaviors including adherence to diet, exercise, and medication prescriptions (28,31,32). Depressive symptom severity, with or without the diagnosis of major depression, may impede self-care behaviors (33). Given the high incidence of depression in diabetes, further research examining a potential relationship between depressive symptoms and intentional insulin omission is important.

A recent U.S. Department of Veterans Affairs study found poorer insulin taking behaviors among African American and Hispanic patients compared with Caucasians (7). One explanation for poorer insulin adherence rates in different socio-demographic groups may be varying diabetes treatment beliefs. Lower-income groups may have more fatalistic beliefs concerning negative treatment outcomes leading to ineffective self-care (34). Further, variations in health care trust and perceived discrimination have been documented in African American patients (35). Finally, African Americans may be more concerned about the harmfulness of medication compared with Caucasian patients, independent of income, medication costs, and health literacy, and thus may be more likely to underuse medications (36). Peyrot et al. did not find any racial/ethnic differences; however, as the researchers state, with only 11% African Americans and 11% Hispanic subjects in the sample, the study may not have had enough statistical power to detect differences.

In order to continue to improve diabetes care and A1C levels, we must understand both providers' barriers to prescribing insulin therapy and patients' barriers to taking insulin as prescribed. We also need effective interventions that are brief, well-validated, and compatible with providers' practice patterns and limited encounter time. Although the study by Peyrot et al. in the current issue of *Diabetes Care* did not address important issues such as other self-care behaviors, weight concerns, the impact of insulin delivery systems, and survey reliability and validity, the study serves an important role in highlighting the avoidance of insulin treatment among a large segment of the diabetic population.

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