# Enhancing Patient Outcomes by Implementing C-peptide Testing for Patients with Diabetes

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Patients with type 1 and type 2 diabetes present similar symptoms, however, the causes are not the same. Type 1 diabetes, which is characterized by deficient insulin production, is considered to be caused by genetics or a trigger in the environment such as a virus. Type 2 diabetes, which is the most common form of diabetes, usually begins with insulin resistance and can be brought on by many factors such as obesity, ethnicity, eating habits or genetics.

Individuals with type 1 diabetes require insulin therapy. Conversely, most people with type 2 diabetes don't need insulin therapy, but rather the condition can often be managed with medication and lifestyle modifications such as diet and exercise.

Accurate diagnosis of diabetes type is crucial considering individuals diagnosed with type 1 diabetes receive insulin therapy. Unnecessary insulin treatment can have harmful effects on individuals including hypoglycemia and insulin related weight gain. However, individuals are at risk of being misdiagnosed with type 1 diabetes because diagnosis is based on imprecise clinical criteria and clinical judgment.


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Understanding the limitations of type 1 diabetes diagnosis criteria and the importance of accurate classification to improve health outcomes, an integrated clinical team at University Hospital of Wales introduced C-peptide testing to re-evaluate patients diagnosed with type 1 diabetes for at least three years.

C-peptide is a biomarker of insulin reserve and can be used to help identify patients incorrectly diagnosed with type 1 diabetes, potentially resulting in the reduction or cessation of insulin treatment. Higher levels of C-peptide indicate the body is producing insulin and lower levels indicate the body is not. Specifically, results that show C-peptide concentration less than 200 pmol/L indicate type 1 diabetes and results that show C-peptide concentration greater than 200 pmol/L prompt follow-up evaluation to potentially re-classify the patient with type 2 diabetes or monogenic diabetes.

The above initiative at University Hospital of Wales has been a resounding success. Since implementation, over 300 patients have been evaluated for re-classification. Of those, 49 patients showed a C-peptide level greater than 200 pmol/L, of whom 38 were re-classified with type 2 diabetes, and 11 patients await reclassification and monogenic diabetes results.

Among the patients previously diagnosed with type 1 diabetes, 20 initiated insulin withdrawal and 17 discontinued insulin therapy completely (majority had C-peptide level >600pmol/l). Those who stopped receiving insulin experienced significant improvements in glycemic control, with a median hemoglobin A1c improvement of 10mmol/mol ($p<0.01$). Additionally, the median body mass index of the off-insulin cohort was reduced by 6kg/m2 ($p < 0.05$). Self-reported quality of life also substantially improved for 15 patients who ceased insulin therapy.

"The strategic incorporation of C-peptide testing into clinical practice has enabled us to establish a precise diagnosis of diabetes, provide patient-centered treatment and safe and effective withdrawal of insulin, enhancing the quality of life for our patients," said Arshiya Tabasum, Consultant of Diabetes and Endocrinology at University Hospital of Wales.

In addition to improving patient care, the initiative led to £27,236 ($34,884) in annual savings due to mitigated insulin use and associated glucose monitoring among the 17 patients who stopped insulin therapy.

The benefits of the initiative inspired the development of C-peptide testing guidelines for adult patients with diabetes, which have been adopted regionally and nationally at all Wales levels.

"By sharing our best practice, we hope that many more patients will benefit worldwide," said Colin Dayan, Professor of Clinical Diabetes and Metabolism at the Cardiff University School of Medicine.