

**EFFECTIVE DATE:** 05|01|2017

**POLICY LAST UPDATED:** 04|04|2017

## OVERVIEW

Chronic intermittent intravenous insulin therapy (CIIT) is a technique for delivering variable-dose insulin to diabetic patients with the goal of improved long-term glycemic control. Through an unknown mechanism, CIIT is postulated to induce insulin-dependent hepatic enzymes to suppress glucose production.

## PRIOR AUTHORIZATION

Prior authorization is not required.

## POLICY STATEMENT

### BlueCHiP for Medicare and Commercial Products

Chronic intermittent intravenous insulin therapy is considered not medically necessary as the evidence is insufficient to determine the effects of the technology on health outcomes.

## MEDICAL CRITERIA

Not applicable

## BACKGROUND

### Glucose Homeostasis

Insulin-mediated glucose homeostasis involves 3 primary functions, which occur at 3 locations: (1) insulin secretion by the pancreas; (2) glucose uptake, primarily in the muscle, liver, gut, and fat; and (3) hepatic glucose production. In the fasting state, when insulin levels are low, most glucose uptake into cells is noninsulin-mediated. Glucose uptake is then balanced by liver production of glucose. However, after a glucose challenge, insulin binds to specific receptors on the hepatocyte to suppress glucose production. Without this inhibition, marked hyperglycemia may result.

### Medications for Glucose Homeostasis in Diabetes

Diabetes is characterized by elevated blood glucose levels due to inadequate or absent insulin production (type 1 diabetes) or due to increased hepatic glucose production, decreased peripheral glucose uptake, and decreased insulin secretion (type 2 diabetes). Different classes of diabetic drug therapy target different aspects of glucose metabolism. Various insulin secretagogues (e.g., sulfonylureas) function by increasing the pancreatic secretion of insulin; thiazolidinediones (e.g., pioglitazone [Actos], rosiglitazone [Avandia]) function in part by increasing glucose uptake in the peripheral (principally skeletal) tissues; and biguanides (e.g., metformin) function by decreasing hepatic glucose production. While patients with type 2 diabetes may be treated with various combinations of all 3 of these classes of drugs, with or without additional insulin, patients with type 1 diabetes, who have no baseline insulin secretion, receive exogenous insulin therapy. Standard insulin management involves use of subcutaneous injection to mimic a physiologic insulin profile. Intravenous insulin is used in the acute inpatient setting to manage hyperglycemic emergencies (e.g., diabetic ketoacidosis).

### Chronic Intermittent Insulin Therapy

Several forms of chronic intermittent insulin therapy, in which insulin is delivered intravenously or into the peritoneal space, have been evaluated.

Chronic intermittent intravenous insulin therapy, also referred to as outpatient intravenous insulin therapy, pulsatile intravenous insulin therapy, hepatic activation therapy, or metabolic activation therapy involves delivering insulin intravenously once weekly over several hours in a pulsatile fashion using a specialized pump controlled by a computerized program that adjusts the doses based on frequent blood glucose monitoring. CIIT is principally designed to normalize the hepatic metabolism of glucose. In 1993, Aoki et al proposed that, in patients with type 1 diabetes, lower levels of insulin in the portal vein are associated with a decreased concentration of the liver enzymes required for hepatic metabolism of glucose. They stated: “We reasoned that if the liver of an IDDM [insulin-dependent diabetes mellitus; i.e., type 1 diabetes] patient could be perfused with near-normal concentrations of insulin during meals, the organ could be reactivated,” and proposed that intermittent intravenous pulsatile infusions of insulin administered once weekly while the patient ingests a carbohydrate meal would increase the portal vein concentrations of insulin, ultimately stimulating the synthesis of glucokinase and other insulin-dependent enzymes. The pulses are designed to deliver a higher, more physiologic concentration of insulin to the liver than is delivered by traditional subcutaneous injections. This higher level of insulin is thought to more closely mimic the body’s natural levels of insulin because it is delivered to the liver. The goal of this outpatient therapy is improved glucose control through improved hepatic activation.

For individuals who have type 1 diabetes who receive CIIT, the evidence includes 2 randomized controlled trials (RCTs) and uncontrolled studies. Relevant outcomes are symptoms, change in disease status, and treatment-related morbidity. A limited number of uncontrolled studies have suggested that CIIT might improve glycemic control. The 2 RCTs reported that CIIT might moderate the progression of nephropathy or retinopathy. However, the published studies were small and reported improvements on intermediate outcomes only (i.e., changes in laboratory values). The clinical significance of the differences reported in these studies is uncertain. Additionally, most published evidence appeared between 1993 and 2000 and, as a result, does not account for recent improvements in diabetes care. The evidence is insufficient to determine the effects of the technology on health outcomes.

## COVERAGE

### BlueCHiP for Medicare and Commercial Products

Benefits may vary between groups/contracts. Please refer to the appropriate section of the Benefit Booklet, Evidence of Coverage, or Subscriber Agreement for services not medically necessary

## CODING

### BlueCHiP for Medicare and Commercial Products

The following code is not medically necessary:

**G9147** Outpatient intravenous insulin treatment (OIVIT) either pulsatile or continuous, by any means, guided by the results of measurements for: respiratory quotient, and/or, urine urea nitrogen (UUN), and/or, arterial, venous or capillary glucose, and/or potassium concentration.

## RELATED POLICIES

None

## PUBLISHED

Provider Update, May 2017

## REFERENCES

1. Aoki TT, Benbarka MM, Okimura MC, et al. Long-term intermittent intravenous insulin therapy and type 1 diabetes mellitus. *Lancet*. Aug 28 1993;342(8870):515-518. PMID 8102666
2. Aoki TT, Grecu EO, Arcangeli MA. Chronic intermittent intravenous insulin therapy corrects orthostatic hypotension of diabetes. *Am J Med*. Dec 1995;99(6):683-684. PMID 7503093
3. Aoki TT, Grecu EO, Prendergast JJ, et al. Effect of chronic intermittent intravenous insulin therapy on antihypertensive medication requirements in IDDM subjects with hypertension and nephropathy. *Diabetes Care*. Sep 1995;18(9):1260-1265. PMID 8612440

4. Weinrauch LA, Sun J, Gleason RE, et al. Pulsatile intermittent intravenous insulin therapy for attenuation of retinopathy and nephropathy in type 1 diabetes mellitus. *Metabolism*. Mar 1 2010;59(10):1429-1434. PMID 20189608
5. Dailey GE, Boden GH, Creech RH, et al. Effects of pulsatile intravenous insulin therapy on the progression of diabetic nephropathy. *Metabolism*. Nov 2000;49(11):1491-1495. PMID 11092517
6. American Diabetes Association (ADA). American Diabetes Association. Standards of Medical Care in Diabetes - 2017. [http://professional.diabetes.org/sites/professional.diabetes.org/files/media/dc\\_40\\_s1\\_final.pdf](http://professional.diabetes.org/sites/professional.diabetes.org/files/media/dc_40_s1_final.pdf). Accessed January 23, 2017.
7. Handelsman Y, Bloomgarden ZT, Grunberger G, et al. American Association of Clinical Endocrinologists and American College of Endocrinology - clinical practice guidelines for developing a diabetes mellitus comprehensive care plan - 2015. *Endocr Pract*. Apr 2015;21 Suppl 1:1-87. PMID 25869408
8. Qaseem A, Chou R, Humphrey LL, et al. Inpatient glycemic control: best practice advice from the Clinical Guidelines Committee of the American College of Physicians. *Am J Med Qual*. Mar-Apr 2014;29(2):95-98. PMID 23709472
9. Centers for Medicaid and Medicare Services. National Coverage Determination (NCD) for Outpatient Intravenous Insulin Treatment (40.7). 2009; <https://www.cms.gov/medicare-coverage-database/details/ncddetails.aspx?NCDId=334&ncdver=1&CoverageSelection=Both&ArticleType=All&PolicyType=Final&s=All&Keyword=intravenous+insulin&KeywordLookUp=Title&KeywordSearchType=And&bc=gAAAAACAAA AAAA%3d%3d> &. Accessed January 25, 2017.

[CLICK THE ENVELOPE ICON BELOW TO SUBMIT COMMENTS](#)

This medical policy is made available to you for informational purposes only. It is not a guarantee of payment or a substitute for your medical judgment in the treatment of your patients. Benefits and eligibility are determined by the member's subscriber agreement or member certificate and/or the employer agreement, and those documents will supersede the provisions of this medical policy. For information on member-specific benefits, call the provider call center. If you provide services to a member which are determined to not be medically necessary (or in some cases medically necessary services which are non-covered benefits), you may not charge the member for the services unless you have informed the member and they have agreed in writing in advance to continue with the treatment at their own expense. Please refer to your participation agreement(s) for the applicable provisions. This policy is current at the time of publication; however, medical practices, technology, and knowledge are constantly changing. BCBSRI reserves the right to review and revise this policy for any reason and at any time, with or without notice. Blue Cross & Blue Shield of Rhode Island is an independent licensee of the Blue Cross and Blue Shield Association.

