Clinical Policy: Allogeneic Hematopoietic Cell Transplants for Sickle Cell Anemia and β-Thalassemia

Reference Number: CP.MP.108
Date of Last Revision: 09/26

Coding Implications
Revision Log

See Important Reminder at the end of this policy for important regulatory and legal information.

Description

This policy describes the medical necessity requirements for allogeneic hematopoietic cell transplants for sickle cell anemia and β–thalassemia. Sickle cell anemia and β–thalassemia are two hemoglobinopathies caused by deleterious genetic alterations in hemoglobin. These monogenic diseases present a range of heterogeneous symptoms that stem from damaged red blood cell function.[1] Despite their limitations, allogeneic hematopoietic cell transplants are the only curative therapies possible for these hemoglobinopathies.

Note:

- *For criteria related to Zynteglo, please see CP.PHAR.545 Betibeglogene Autotemcel (Zynteglo).*
- *For criteria related to Casgevy, please see CP.PHAR.603 Exagamglogene Autotemcel (Casgevy).*
- *For criteria applicable to Medicare plans, please see MC.CP.MP.108 Allogeneic Hematopoietic Cell Transplants for Sickle Cell Anemia and β-Thalassemia.*

Policy/Criteria

I. It is the policy of health plans affiliated with Centene Corporation® that *evaluations* for allogeneic hematopoietic cell transplants for sickle cell anemia and homozygous β-thalassemia are **medically necessary** when one of the following criteria are met:

A. Sickle cell anemia and member has a history of stroke or is at high risk of stroke or end-organ damage, as shown by at least one of the following: prior stroke, recurrent acute chest syndrome, recurrent vaso-occlusive crises, or red blood cell alloimmunization on chronic transfusion therapy;

B. Homozygous β-thalassemia and member is transfusion-dependent due to thalassemia.

II. It is the policy of health plans affiliated with Centene Corporation® that allogeneic hematopoietic cell transplants for sickle cell anemia and homozygous β-thalassemia are **medically necessary** when all the following criteria are met:

A. One of the following indications:

1. Sickle cell anemia, meets all:
   a. HLA-matched, first-degree relative donor is available;
   b. History of stroke or is at high risk of stroke or end-organ damage, as shown by at least one of the following: prior stroke, recurrent acute chest syndrome, recurrent vaso-occlusive crises, or red blood cell alloimmunization on chronic transfusion therapy;
2. Homozygous β-thalassemia, meets the following:
   a. HLA-matched donor is available, one of the following:
      i. Cord blood is the source of stem cells;
      ii. Bone marrow is the source of stem cells;

iii. Peripheral blood is the source, and the donor is either unable to, or refuses to donate bone marrow;

b. Transfusion-dependent due to thalassemia;

c. A standard, myeloablative conditioning regimen will be used;

B. Does not have ANY of the following absolute contraindications:

1. Infections with highly virulent and/or resistant microbes that are poorly controlled pre-transplant;
2. Inability to adhere to the regimen necessary to preserve the transplant, even with caregiver support;
3. Active substance use or dependence including current tobacco use, vaping, marijuana use (unless prescribed by a licensed practitioner), or IV drug use without convincing evidence of risk reduction behaviors (unless urgent transplant timelines are present, in which case a commitment to reducing behaviors is acceptable).

Note: Data suggests that younger recipients have better outcomes following AHCT than those who are older at the time of transplant.

III. It is the policy of health plans affiliated with Centene Corporation that there is insufficient evidence regarding the safety and efficacy of the following:

A. Autologous hematopoietic cell transplant for sickle cell anemia not in the context of gene therapy;

B. Autologous hematopoietic cell transplant for β-thalassemia not in the context of gene therapy;

C. Allogeneic hematopoietic cell transplants for the treatment of sickle cell anemia or homozygous *β*- Thalassemia for any-indications other than those specified above.

Background

Hemoglobinopathies are a group of over 1,000 hematological disorders that result from deleterious molecular alterations to hemoglobin and are broadly classified into two categories based on the phenotypic characteristics of these variations.[1] The first of these categories includes disorders, such as sickle cell anemia, in which there is a structural defect in one of the globin subunits.[1] Thalassemia belongs to the second category of hemoglobinopathies in which there is a quantitative defect in the production of one or more of the globin subunits.[1]

In adults, hemoglobin is a heterotetramer that is comprised of the α-and β-globin subunits.[2] Each globin subunit forms a stable linkage with heme so that oxygen in the cytosol of an erythrocyte can bind reversibly to heme's iron atoms.[2] The hemoglobin tetramer $\alpha_2\beta_2$ binds and unloads oxygen in a cooperative manner, which maximizes the transport of oxygen to cells.[2] Additional gas transport functions of hemoglobin include the transport of carbon dioxide and nitric oxide.[3] Each of these physiological aspects of hemoglobin are deleteriously affected in the hemoglobinopathy disorders.

Sickle Cell Anemia and β-Thalassemia

Sickle cell disease results from a synonymous mutation that exchanges glutamic acid with valine at position 6 in the β-globin subunit.[4] Homozygous inheritance of this mutation results in the disease phenotype, whereas heterozygous carriers do not exhibit clinical disease symptoms; heterozygous carriers are also referred to as having sickle cell trait. [4] This amino acid substitution causes deoxygenated hemoglobin to rigid polymers in red blood cells, which ultimately forms the classic sickle-shaped morphology.[2] The sickle red blood cells occlude the microvasculature which leads to tissue hypoxia, infarction, and chronic hemolytic anemia.[4] Thus, sickle cell anemia presents a heterogeneous range of clinical manifestations, including pain, strokes, vaso-

occlusive episodes, multi-organ injury, reduced quality of life, and shortened lifespan.[2,4]

Autosomal mutations in the gene encoding the β-globin subunit cause β-thalassemia (also known as thalassemia major or Cooley's anemia).[5] These mutations inhibit the synthesis of β-globin in erythropoietic cells.[2,5] The extent of the molecular basis for these mutations is very heterogeneous because over 200 mutations within the β-globin subunit, ranging from synonymous mutations to deletions.[1] Consequently, α-globin molecules form toxic aggregates which destroy erythroid precursors through a process called ineffective erythropoiesis.[2,5] Also, individuals with β-thalassemia suffer from anemia due to shortened red blood cell survival, hemolytic anemia.[5]

Hematopoietic Cell Transplantation
Hematopoietic cell transplantation (HCT) is recognized as the only cure for sickle cell disease, and the success rate for specific pediatric groups has been shown to be 85 to 90%.[4] In the United States, it is estimated that the number of children with homozygous sickle cell anemia is 70,000 to 100,000, of which 5,000 to 7,000 could be eligible for transplantation.[6] A survey of the European Blood and Marrow Transplant and CIBMTR data files that approximately 1,200 patients in total have received HCT for sickle cell disease, and the three year survival rate is approximately 90% regardless of the source of hematopoietic stem cells.[6] Furthermore, Lucarelli et al. and Angelucci et al. both have documented the literature for recent reports on outcomes of HCT from HLA-matched donors in cases of β-thalassemia.[7,8] Although stem cell sources and the risk categories of the patients vary, overall survival and thalassemia-free survival range from approximately 65% to 90 % among the numerous reports.[7,8]

The establishment of complete donor-derived erythropoiesis can stabilize function in affected organs, such as the central nervous system and lungs.[9] However, HCT related organ toxicities, graft vs. host disease, graft rejection, and donor availability are major limitations of this procedure.[9] Infertility and gonadal failure are two specific morbidities with which HCT is associated.[4] Also, use of fully matched sibling donors as potentially eligible donors is one of the limitations for HCT implementation.[4] However, siblings are preferable HCT donors due to the lowered risk of graft vs host disease.[6] Use of an HLA-matched sibling donor is supported by the most robust long-term evidence demonstrating favorable overall survival outcomes. However, only 14% to 20% of individuals with sickle cell disease have an HLA-matched sibling donor, which substantially limits access to potential curative transplantation.[10,11] Consequently, there has been increasing interest in alternative donor strategies, particularly haploidentical donors, who are available for the vast majority of patients.[12,13]

Evidence is still emerging regarding the use of haploidentical donors, but advances in transplant techniques, including reduced-intensity or nonmyeloablative conditioning regimens, have improved the feasibility and safety of haploidentical transplantation. Early studies demonstrated reductions in graft rejection and graft-versus-host disease (GVHD), while maintaining high rates of donor engraftment and disease-free survival compared with earlier haploidentical approaches. More recent prospective multicenter studies have reported encouraging outcomes, including increased overall survival, durable donor engraftment, resolution of vaso-occlusive complications, and acceptable rates of acute and chronic GVHD. Despite these promising findings, graft failure, mixed chimerism, infections, immune reconstitution, and regiment-related toxicities remain important considerations, and long-term follow-up is limited.[10,12,13,14,15]

The largest prospective evaluation to date is the 2024 international Phase II learning collaborative, which evaluated haploidentical bone marrow transplantation in patients with

severe sickle cell disease who lacked a matched sibling donor. The study demonstrated high overall survival with favorable engraftment and disease control across multiple centers. The investigators concluded that haploidentical transplantation represents a promising curative option for appropriately selected patients when a matched sibling donor is unavailable, while acknowledging that continued follow-up is necessary to better define long-term outcomes, fertility, late effects, and optimal patient selection.[13]

Current professional society guidance acknowledges that evidence supporting haploidentical donor transplantation for sickle cell disease continues to emerge. The American Society of Hematology (ASH) 2021 Clinical Practice Guideline recommends matched sibling donor transplantation over standard care for appropriate patients with severe sickle cell disease but does not make a recommendation for routine use of alternative donor transplantation due to very low-certainty evidence. Instead, ASH suggests that transplantation from alternative donors, including haploidentical donors, should be performed within the context of a clinical trial or at an experienced transplant center, while additional evidence is generated. The guideline identifies alternative donor transplantation as an important area of ongoing research and acknowledges that improvements in conditioning regimens and GVHD prophylaxis may expand future indications.[12]

Other differences between the considerations for HCT for β-thalassemia and sickle cell anemia include key issues for risk factors for transplant-related complications, transplant outcome, and conditioning regimen.[8] The major risk factors when considering HCT for β-thalassemia include age and organ dysfunction due to iron overload, whereas the major risk factors for HCT due to sickle cell anemia are age and history of cerebral events.[8] Control of iron overload and related tissue damage is a significant consideration for HCT for β-thalassemia, while obtaining a cure from chronic inflammation and prevention of sickle cell related organ damage must be considered for sickle cell anemia.[8] Lastly, β-thalassemia patients require an ablative conditioning regimen, whereas a reduced intensity regimen seems to induce stable chimerism and full donor erythropoiesis in sickle cell anemia patients.[8]

Coding Implications

This clinical policy references Current Procedural Terminology (CPT®). CPT® is a registered trademark of the American Medical Association. All CPT codes and descriptions are copyrighted 2025, American Medical Association. All rights reserved. CPT codes and CPT descriptions are from the current manuals and those included herein are not intended to be all-inclusive and are included for informational purposes only. The following codes are for informational purposes only. They are current at time of review of this policy. Inclusion or exclusion of any codes does not guarantee coverage. Providers should reference the most up-to-date sources of professional coding guidance prior to the submission of claims for reimbursement of covered services.

CPT®* Codes	Description
38205	Blood-derived hematopoietic progenitor cell harvesting for transplantation, per collection; allogeneic
38240	Hematopoietic progenitor cell (HPC); allogeneic transplantation per donor

HCPCS Codes	Description

S2150	Bone marrow or blood-derived stem cells (peripheral or umbilical), allogeneic or autologous, harvesting, transplantation, and related complications; including: pheresis and cell preparation/storage; marrow ablative therapy; drugs, supplies, hospitalization with outpatient follow-up; medical/surgical, diagnostic, emergency, and rehabilitative services; and the number of days of pre- and posttransplant care in the global definition

Reviews, Revisions, and Approvals	Revision Date	Approval Date
Policy developed	03/16	03/16
Annual Review. References reviewed, updated, and reformatted. Reviewed by internal specialist.	10/22	10/22
Added contraindication criteria I.C.1. through 4. Removed ICD-10 code table from policy.	02/23	02/23
Annual review. Added note at end of Description regarding criteria related to Zynteglo. Criterion I.C.3. removed related to lack of adequate support system. Expanded Criteria II.A. and Criteria II.B. to specify not in the context of gene therapy. Background updated with no impact on criteria. References reviewed and updated. Reviewed by internal and external specialist.	10/23	10/23
Added note to policy to refer to MC.CP.MP.108 for Medicare criteria. Added "non-Medicare" to health plans in Policy/Criteria I. and II.	11/23	
Annual review. Added note at end of Description regarding criteria related to Casgevy. Reformatted all notes in policy description. Reformatted Criteria I.A. to specify one of the following. Minor format changes in Criteria I. with no impact to criteria. References reviewed and updated.	08/24	08/24
Annual review. Removed age limit criteria from previous Criteria I.A.1.a. and previous Criteria I.A.2.a. Added clarifying language to Criteria I.A.1.b. regarding high risk of stroke. Removed first-degree relative donor requirement for cord blood as the source of stem cells for homozygous β-thalassemia in Criteria I.A.2.a.i. Removed Criteria I.A.5. regarding provider specializing in treating thalassemia. Removed serial blood and urine testing details in Criteria I.B.3. Added Note at end of Criteria I. regarding younger recipients having better outcomes following AHCT. Updated verbiage in Criteria II.C. for clarity. Coding and descriptions reviewed. References reviewed and updated. Reviewed by internal specialist and external specialist.	08/25	08/25
Annual review. Added new criteria I. for transplant evaluations. Background updated with no impact to criteria. Coding and descriptions reviewed. References reviewed and updated. Reviewed by internal specialists.	09/26	09/26

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Important Reminder

This clinical policy has been developed by appropriately experienced and licensed health care professionals based on a review and consideration of currently available generally accepted standards of medical practice; peer-reviewed medical literature; government agency/program approval status; evidence-based guidelines and positions of leading national health professional organizations; views of physicians practicing in relevant clinical areas affected by this clinical policy; and other available clinical information. The Health Plan makes no representations and accepts no liability with respect to the content of any external information used or relied upon in developing this clinical policy. This clinical policy is consistent with standards of medical practice current at the time that this clinical policy was approved. “Health Plan” means a health plan that has adopted this clinical policy and that is operated or administered, in whole or in part, by Centene Management Company, LLC, or any of such health plan’s affiliates, as applicable.

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Note: For Medicaid members/enrollees, when state Medicaid coverage provisions conflict with the coverage provisions in this clinical policy, state Medicaid coverage provisions take precedence. Please refer to the state Medicaid manual for any coverage provisions pertaining to this clinical policy.

Note: For Medicare member/enrollees, to ensure consistency with the Medicare National Coverage Determinations (NCD) and Local Coverage Determinations (LCD), all applicable NCDs, LCDs, and Medicare Coverage Articles should be reviewed prior to applying the criteria set forth in this clinical policy. Refer to the CMS website at http://www.cms.gov for additional information.

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