Policy Number	**SUR703.040**
Policy Effective Date	**06/15/2025**

Hematopoietic Cell Transplantation for Hodgkin Lymphoma (HL)

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Related Policies (if applicable)
SUR703.002: Hematopoietic Cell Transplantation (HCT) or Additional Infusion Following Preparative Regimens (General Donor and Recipient Information)

Disclaimer

Carefully check state regulations and/or the member contract.
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Coverage

Autologous hematopoietic cell transplantation (HCT) **may be considered medically necessary** in individuals with primary refractory or relapsed Hodgkin lymphoma.

Allogeneic HCT, using either myeloablative or reduced-intensity conditioning regimens, **may be considered medically necessary** in individuals with primary refractory or relapsed Hodgkin lymphoma.

Second autologous HCT for relapsed lymphoma after a prior autologous HCT **is considered experimental, investigational and/or unproven**.

Tandem autologous HCT **is considered experimental, investigational and/or unproven** in individuals with Hodgkin lymphoma.

Other uses of HCT in individuals with Hodgkin lymphoma **are considered experimental, investigational and/or unproven**, including, but not limited to, initial therapy for newly diagnosed disease to consolidate a first complete remission.

Policy Guidelines

In the Morschhauser et al. (2008) study of risk-adapted salvage treatment with single or tandem autologous hematopoietic cell transplantation for first relapse or refractory Hodgkin lymphoma, poor-risk relapsed Hodgkin lymphoma was defined as 2 or more of the following risk factors at first relapse: time to relapse less than 12 months, stage III or IV at relapse, and relapse within previously irradiated sites. The primary refractory disease was defined as disease regression less than 50% after 4 to 6 cycles of doxorubicin-containing chemotherapy or disease progression during induction or within 90 days after the end of first-line treatment.

The ideal allogeneic donors are human leukocyte antigen-identical matched siblings. Related donors mismatched at a single locus are also considered suitable donors. A matched, unrelated donor identified through the National Marrow Donor Program is typically the next option considered. Recently, there has been interest in haploidentical donors, typically a parent or a child of the individual, with whom usually there is sharing of only 3 of the 6 major histocompatibility antigens. Most individuals will have such a donor; however, the risk of graft-versus-host disease and overall morbidity of the procedure may be severe, and experience with these donors is not as extensive as that with matched donors.

Description

Hodgkin lymphoma (HL) results from a clonal expansion of a B-cell lineage, characterized by the presence of Reed-Sternberg cells on pathology. Standard treatment is based on the stage at presentation and may involve chemotherapy with or without radiotherapy. Hematopoietic cell transplantation (HCT) has been used for HL, particularly in the setting of relapse or refractory disease.

Hodgkin Lymphoma

Hodgkin Lymphoma (HL) is a relatively uncommon B-cell lymphoma. In 2024, the estimated number of new cases in the United States was approximately 8,570, with 910 estimated deaths related to HL. (1) The disease has a bimodal distribution, with most patients diagnosed between the ages of 20 and 39 years, with a second peak in adults aged 65 years and older.

The 2008 World Health Organization (WHO) classification divided HL into 2 main types (2); these classifications did not change in the 2022 update: (3)

1. “Classical” HL
    - Nodular sclerosis,
    - Mixed cellularity,
    - Lymphocyte depleted,

- Lymphocyte-rich,

2. Nodular lymphocyte-predominant HL.

In Western countries, "classical" HL accounts for 95% of cases of HL and, for nodular lymphocyte-predominate HL, only 5%. (4) "Classical" HL is characterized by the presence of neoplastic Reed-Sternberg cells in a background of numerous non-neoplastic inflammatory cells. Nodular lymphocyte-predominate HL lacks Reed-Sternberg cells but is characterized by the presence of lymphocytic and histiocytic cells termed "popcorn cells".

Staging

The Ann Arbor staging system for HL recognizes that the disease is thought typically to arise in a single lymph node and spread to contiguous lymph nodes with eventual involvement of extranodal sites. The staging system attempts to distinguish patients with localized HL who can be treated with extended field radiation from those who require systemic chemotherapy.

Each stage is subdivided into A and B categories. "A" indicates no systemic symptoms are present and "B" indicates the presence of systemic symptoms, which include unexplained weight loss of more than 10% of body weight, unexplained fevers >38^{o}C, or drenching night sweats (see Table 1). (4)

Table 1. Ann Arbor Staging System for Hodgkin Lymphoma

Stage	Area of Concern
I	Single lymph node region (I) or localized involvement of a single extralymphatic organ or site (I_E).
II	2 or more lymph node regions on the same side of the diaphragm (II) or localized involvement of a single associated extralymphatic organ or site and its regional lymph node(s) with or without involvement of other lymph node regions on the same side of the diaphragm (II_E). The number of lymph node regions involved should be indicated by a subscript (e.g., II_2).
III	Involvement of lymph node regions or structures on both sides of the diaphragm, which may involve an extralymphatic organ or site (III_E), spleen (III_S), or both (III_{E+S}).
IV	Disseminated (multifocal) involvement of 1 or more extralymphatic organs, with or without associated lymph node involvement, or isolated extralymphatic organ involvement with distant (nonregional) nodal involvement.

Patients with HL are generally classified into 3 groups:

- Early-stage favorable (stage I to II with no B symptoms, large mediastinal lymphadenopathy, or other unfavorable factors),
- Early-stage unfavorable (stage I to II with large mediastinal mass, multiple involved nodal regions, B symptoms, extranodal involvement, or elevated erythrocyte sedimentation rate $\geq$50), and
- Advanced-stage disease (stage III to IV). (4)

Treatment

Patients with non-bulky stage IA or IIA disease are considered to have the clinically early-stage disease. These patients are candidates for chemotherapy, combined modality therapy, or radiotherapy alone. (5) Patients with obvious stage III or IV disease, bulky disease (defined as a 10-cm mass or mediastinal disease with a transverse diameter >33% of the transthoracic diameter), or the presence of B symptoms will require combination chemotherapy with or without additional radiotherapy.

Hodgkin lymphoma is highly responsive to conventional chemotherapy, and up to 80% of newly diagnosed patients can be cured with chemotherapy and/or radiotherapy. Patients who prove refractory or who relapse after first-line therapy have a significantly worse prognosis. Primary refractory HL is defined as disease regression of less than 50% after 4 to 6 cycles of anthracycline-containing chemotherapy, disease progression during induction therapy, or progression within 90 days after the completion of the first-line treatment. (6)

In patients with relapse, the results of salvage therapy vary depending on a number of prognostic factors, as follows: the length of the initial remission, stage at recurrence, and the severity of anemia at the time of relapse. (7) Early and late relapse are defined as less or more than 12 months from the time of remission, respectively. Approximately 70% of patients with late first relapse can be salvaged by autologous hematopoietic cell transplantation (HCT) but not more than 40% with early first relapse. (8)

Only 25% to 35% of patients with primary progressive or poor-risk recurrent HL achieve durable remission after autologous HCT, with most failures being due to disease progression after transplant. Most relapses after transplant occur within 1 to 2 years, and once relapse occurs posttransplant, median survival is less than 12 months.

<u>Hematopoietic Cell Transplantation</u>

Hematopoietic cell transplantation is a procedure in which hematopoietic stem cells are intravenously infused to restore bone marrow and immune function in cancer patients who receive bone marrow-toxic doses of cytotoxic drugs with or without whole body radiotherapy. Hematopoietic stem cells may be obtained from the transplant recipient (autologous HCT) or a donor (allogeneic HCT [allo-HCT]). These cells can be harvested from bone marrow, peripheral blood, or umbilical cord blood shortly after delivery of neonates.

Immunologic compatibility between infused hematopoietic stem cells and the recipient is not an issue in autologous HCT. In allogenic stem cell transplantation, immunologic compatibility between donor and patient is a critical factor for achieving a successful outcome. Compatibility is established by typing of human leukocyte antigens (HLA) using cellular, serologic, or molecular techniques. Human leukocyte antigen refers to the gene complex expressed at the HLA-A, -B, and -DR (antigen-D related) loci on each arm of chromosome 6. An acceptable donor will match the patient at all or most of the HLA loci.

<u>Conditioning for Hematopoietic Cell Transplantation</u>

Conventional Conditioning
The conventional ("classical") practice of allo-HCT involves administration of cytotoxic agents (e.g., cyclophosphamide, busulfan) with or without total body irradiation at doses sufficient to cause bone marrow ablation in the recipient. The beneficial treatment effect of this procedure is due to a combination of initial eradication of malignant cells and subsequent graft-versus-malignancy effect mediated by non-self-immunologic effector cells. While the slower graft-versus-malignancy effect is considered the potentially curative component, it may be overwhelmed by existing disease in the absence of pretransplant conditioning. Intense conditioning regimens are limited to patients who are sufficiently medically fit to tolerate substantial adverse effects. These include opportunistic infections secondary to loss of endogenous bone marrow function and organ damage or failure caused by the cytotoxic drugs. Subsequent to graft infusion in allo-HCT, immunosuppressant drugs are required to minimize graft rejection and graft-versus-host disease (GVHD), which increases susceptibility to opportunistic infections.

The success of autologous HCT is predicated on the potential of cytotoxic chemotherapy, with or without radiotherapy, to eradicate cancerous cells from the blood and bone marrow. This permits subsequent engraftment and repopulation of the bone marrow with presumably normal hematopoietic stem cells obtained from the patient before undergoing bone marrow ablation. Therefore, autologous HCT is typically performed as consolidation therapy when the patient's disease is in complete remission. Patients who undergo autologous HCT are also susceptible to chemotherapy-related toxicities and opportunistic infections before engraftment, but not GVHD.

Reduced-Intensity Conditioning Allogeneic Hematopoietic Cell Transplantation
Reduced-intensity conditioning (RIC) refers to the pretransplant use of lower doses of cytotoxic drugs or less intense regimens of radiotherapy than are used in traditional full-dose myeloablative conditioning treatments. Although the definition RIC is variable, with numerous versions employed, all regimens seek to balance the competing effects of relapse due to residual disease and non-relapse mortality. The goal of RIC is to reduce disease burden and to minimize associated treatment-related morbidity and non-relapse mortality in the period during which the beneficial graft-versus-malignancy effect of allogeneic transplantation develops. Reduced-intensity conditioning regimens range from nearly total myeloablative to minimally myeloablative with lymphoablation, with intensity tailored to specific diseases and patient condition. Patients who undergo RIC with allo-HCT initially demonstrate donor cell engraftment and bone marrow mixed chimerism. Most will subsequently convert to full donor chimerism. In this medical policy, the term RIC will refer to all conditioning regimens intended to be nonmyeloablative.

<u>Targeted Chemotherapy and Autologous Hematopoietic Cell Transplantation for the Treatment of Hodgkin Lymphoma</u>
A recent important development in the HL treatment landscape is the emergence of several novel agents that are now being used as alternatives to stem cell transplantation in patients at high-risk for relapse after chemotherapy or relapse following autologous HCT. These agents

include brentuximab vedotin, a CD30-directed antibody-drug conjugate, and nivolumab and pembrolizumab, which are 2 programmed death receptor-1 (PD-1) blocking antibodies. The U.S. Food and Drug Administration (FDA) regulatory status of these agents for the treatment of HL is summarized in Table 2.

Brentuximab vedotin was evaluated in a large, phase 3, multinational, double-blind randomized controlled trial (RCT) known as the AETHERA trial (abbreviation definition unknown). Moskowitz et al. (2015) (9) reported on the outcomes for 329 individuals with HL with risk factors for post-transplantation relapse or progression (e.g., primary refractory HL, relapse <12 months after initial therapy, and/or relapse with extranodal disease). Results showed that early consolidation with brentuximab vedotin after autologous HCT significantly improved 2-year progression-free survival (PFS) versus placebo (63% versus 51%, hazard ratio [HR] 0.57; 95% confidence interval [CI], 0.40 to 0.81). At 5-year follow-up, the significant PFS benefit for brentuximab vedotin persisted (59% versus 41%; HR 0.52; 95% CI, 0.38 to 0.72). (10) In addition, a study by Smith et al. (2018) (11) of tandem autologous HCT observed that the 2-year PFS of 63% for brentuximab vedotin demonstrated in the AETHERA RCT "matches" the 2-year PFS rates for tandem autologous HCT.

A survival benefit with novel agents has been found in the setting of relapse post-autologous HCT. Bair et al. (2017) reported a retrospective comparative analysis that evaluated the outcomes of 87 individuals with relapsed/refractory HL who had relapsed post-autologous HCT. (12) Compared to individuals who did not receive any novel agents, those that received novel agents, including brentuximab vedotin or nivolumab, experienced a significant improvement in median overall survival (85.6 versus 17.1 months; p<.001). The availability of safe and effective targeted systemic therapy represents an alternative to the use of a second autologous transplant or planned tandem autologous HCT for HL consolidation treatment or relapse/refractory disease treatment.

Regulatory Status

The FDA regulates human cells and tissues intended for implantation, transplantation, or infusion through the Center for Biologics Evaluation and Research, under Code of Federal Regulation, title 21, parts 1270 and 1271. Hematopoietic stem cells are included in these regulations.

Table 2 describes several novel agents that have been approved by the FDA for use as alternatives to tandem autologous HCT or a second autologous HCT in individuals at high-risk for, or with, respectively, refractory or relapsed HL following autologous HCT.

Table 2. Novel Agents Approved by the U.S. Food and Drug Administration

Drug	BLA	Type of Agent	Manufacturer	FDA-approved indications for post-autologous HCT use	Date FDA approved
Brentuximab vedotin	125388	CD30-directed	Seattle Genetics	• Classical HL at high risk of relapse or	Aug 2015

		antibody-drug conjugate		progression as post-autologous HCT consolidation • Classical HL after failure of autologous HCT	
Nivolumab	125554	PD-1 blocking antibody	Bristol Myers Squibb	Classical HL that has relapsed or progressed after autologous HCT and posttransplantation brentuximab vedotin	May 2016
Pembrolizumab	125514	PD-1 blocking antibody	Merck Sharp Dohme	Adult and pediatric patients with refractory classical HL, or who have relapsed after 3 or more prior lines of therapy[a]	Mar 2017

BLA: Biologic License Application; FDA: U.S. Food and Drug Administration; HCT: hematopoietic cell transplantation; HL: Hodgkin lymphoma; PD-1: programmed death receptor-1.
[a] In the pivotal, multicenter, nonrandomized, open-label study, prior lines of therapy included prior autologous HCT (61%) and brentuximab (83%).

Rationale

Medical policies assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function, including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

AUTOLOGOUS HEMATOPOIETIC CELL TRANSPLANTATION FOR HODGKIN LYMPHOMA

First-Line Therapy for Hodgkin Lymphoma

Clinical Context and Therapy Purpose

The purpose of autologous hematopoietic cell transplantation (HCT) as first-line therapy is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with Hodgkin lymphoma (HL).

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with HL.

Interventions

The therapy being considered is autologous HCT as first-line therapy.

Comparators

Comparators of interest include standard of care.

Outcomes

The general outcomes of interest are overall survival (OS), disease specific survival (DSS), change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Randomized Controlled Trials

Federico et al. (2003) published results from an RCT of 163 patients with unfavorable HL who had received autologous HCT or additional standard chemotherapy for consolidation after initial conventional chemotherapy. (13) Patients were randomized to high-dose chemotherapy (HDC) followed by autologous HCT (n=83) or to 4 additional courses of the same standard chemotherapy used in the induction phase (n=80). After treatment, complete remission (CR) was achieved in 92% of patients in the autologous HCT arm and 89% in the standard chemotherapy arm (p=0.6). Five-year survival rates (overall, failure-free and relapse-free) did

not differ between the treatment groups, and the authors concluded that HDC with autologous HCT offered no benefit in outcomes over conventional chemotherapy as first-line therapy for patients with advanced HL.

Carella et al. (2009) published 10-year follow-up results for the Federico study. (14) Ten-year OS rates were 85% (95% confidence interval [CI], 78% to 90%) for the HDC autologous HCT group and 84% (95% CI, 77% to 89%; p=0.7) for the standard chemotherapy group. Ten-year failure-free survival rates were 79% (95% CI, 72% to 85%) for the HDC autologous HCT group and 75% (95% CI, 67% to 82%; p=0.8) for the standard chemotherapy group. The authors concluded that, after a median follow-up of 107 months, their data suggested patients who respond to induction therapy with conventional chemotherapy do not achieve superior outcomes with consolidation with HDC and autologous HCT.

Section Summary: Autologous Hematopoietic Cell Transplantation as First-Line Therapy for Hodgkin Lymphoma

A small number of RCTs have evaluated the use of autologous HCT as first-line treatment for HL, and these trials have reported no benefit above that of conventional chemotherapy.

Relapsed or Refractory Hodgkin Lymphoma

Clinical Context and Therapy Purpose

The purpose of autologous HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with relapsed or refractory HL.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with relapsed or refractory HL.

Interventions

The therapy being considered is autologous HCT.

Comparators

Comparators of interest include standard of care.

Outcomes

The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.

- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Systematic Reviews

A systematic review and meta-analysis of the available RCTs on HCT for patients with relapsed or refractory HL was published by Rancea et al. (2014). (15) Reviewers included 3 RCTs, 2 (1993, 2002) of which compared HDC plus autologous HCT with conventional treatment. (16, 17) Both trials (described below) were judged to be at moderate risk of bias using the Cochrane criteria. Combined analysis for the outcome of OS demonstrated a hazard ratio (HR) of 0.67 for patients treated with autologous HCT, which was not statistically significant (95% CI, 0.41 to 1.07). For the outcome of progression-free survival (PFS), there was a significant improvement for autologous HCT treatment, with a HR of 0.55 (95% CI, 0.35 to 0.86).

Randomized Controlled Trials

The British National Lymphoma Investigation study (1993) was the first to show that autologous HCT offered patients with relapsed or refractory HL a PFS benefit over conventional chemotherapy. (18) Forty patients with relapsed or refractory HL were given chemotherapy without transplant (n=20) or autologous HCT after HDC (n=20). (16) A significantly better event-free survival rate at 3 years (53%) was reported for patients who underwent HCT than for those who did not (10%).

Subsequently, these findings were confirmed in a larger 2002 trial by the German Hodgkin Study Group and European Group for Blood and Marrow Transplantation. (17) Patients relapsing after initial chemotherapy were randomized to chemotherapy without a transplant or to autologous HCT. In the final analysis of 144 patients, freedom from treatment failure at 3 years was 55% in the transplanted group versus 34% in the non-transplanted group. This benefit was maintained in a 2007 subgroup analysis, regardless of early or late relapse, and the results were confirmed in follow-up data at 7 years. (19)

Nonrandomized Studies

In addition to the RCTs, several large retrospective studies identified in a systematic review have reported event-free survival rates ranging from 25% to 60%, with OS rates from 35% to 66%, showing that disease status before autologous HCT was the most important prognostic factor for the final outcome. (6)

A retrospective observational cohort study by Merryman et al. (2021) evaluated autologous HCT after anti-programmed death-1 (PD-1) therapy for patients with relapsed or refractory HL. (20) Seventy-eight patients were identified who underwent autologous HCT as a third-line (or later) treatment; 74% of patients underwent autologous HCT after anti-PD-1 treatment and 26% of patients received anti-PD-1 treatment along with additional therapy prior to autologous HCT. The 18-month PFS and OS after autologous HCT were 81% (95% CI, 69 to 89) and 96%

(95% CI, 87 to 99), respectively. Favorable outcomes were reported for patients who had received greater than 4 systemic therapies before autologous HCT (18-month PFS, 73%), who were refractory to 2 consecutive therapies immediately prior to anti-PD-1 treatment (18-month PFS, 78%), and who had positive pre-HCT positron emission tomography (PET) (18-month PFS, 75%); patients who were non-responders to anti-PD-1 treatment had inferior outcomes (18-month PFS, 51%).

Section Summary: Autologous Hematopoietic Cell Transplantation for Relapsed or Refractory Hodgkin Lymphoma

Randomized controlled trials and a meta-analysis have evaluated the use of autologous HCT for relapsed or refractory HL. The studies reported no difference in OS, but a significant improvement in PFS, for patients treated with autologous HCT.

Second Autologous Hematopoietic Cell Transplantation for Relapsed Hodgkin Lymphoma After Prior Autologous Hematopoietic Cell Transplantation

Clinical Context and Therapy Purpose

The purpose of a second autologous HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with relapsed HL after an autologous HCT.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with relapsed HL after an autologous HCT.

Interventions

The therapy being considered is a second autologous HCT.

Comparators

Comparators of interest include standard of care.

Outcomes

The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.

- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Few treatment options exist for patients who relapse following an autologous HCT. These include single-agent palliative chemotherapy or occasionally, localized radiotherapy. (19) If further remission is attained with conventional-dose chemotherapy, it is rarely durable, with a median OS of less than 1 year. (21)

Case Series

There is limited experience with second autologous HCT, and treatment-related mortality is high (25%-40%). (16) Smith et al. (2008) reported on the outcomes of 40 patients (21 with HL, 19 with non-HL) who underwent a second autologous HCT for relapsed lymphoma. (22) Reported results were combined for the 2 populations, but authors stated the outcomes for both patient groups were similar. Median age at second HCT was 38 years (range, 16 to 61 years). In 82% of patients, the second HCT was performed more than 1 year after the first. The treatment-related mortality at day 100 posttransplant was 11% (95% CI, 3% to 22%). At a median follow-up of 72 months (range, 12 to 124 months) after the second HCT, 73% of patients had died, 62% due to relapsed lymphoma. One-, 3-, and 5-year PFS estimates were 50% (95% CI, 34% to 66%), 36% (95% CI, 21% to 52%), and 30% (95% CI, 16% to 46%), respectively. Corresponding OS estimates were 65% (95% CI, 50% to 79%), 36% (95% CI, 22% to 52%), and 30% (95% CI, 17% to 46%), respectively. Study limitations included the absence of an appropriate comparison group and lack of data on how many patients were considered for a second HCT but were unable to mobilize sufficient stem cells or were otherwise unable to proceed to the second transplant. Finally, heterogeneity of the preparative regimens used in this population precluded comparison of efficacy.

Section Summary: Second Autologous Hematopoietic Cell Transplantation for Relapsed Hodgkin Lymphoma After Prior Autologous Hematopoietic Cell Transplantation

The evidence is limited to case series; no RCTs or nonrandomized comparative studies were identified. In 1 series, treatment-related mortality at 100 days was 11%, and the mortality rate was 73% at a median follow-up of 72 months.

ALLOGENEIC HEMATOPOIETIC CELL TRANSPLANTATION FOR HODGKIN LYMPHOMA

First-Line Therapy for Hodgkin Lymphoma

Clinical Context and Therapy Purpose

The purpose of allogeneic (allo)-HCT as first-line therapy is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with HL.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with HL.

Interventions
The therapy being considered is allo-HCT as first-line therapy.

Comparators
Comparators of interest include standard of care.

Outcomes
The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

The application of allo-HCT to the treatment of patients with HL appears limited, due to a high procedure-related mortality. No controlled trials evaluating allo-HCT as first-line treatment for HL were identified. In addition, 2015 and 2016 systematic reviews of HCT for HL did not discuss studies using allo-HCT as first-line therapy. (23, 24)

Section Summary: Allogeneic Hematopoietic Cell Transplantation as First-Line Therapy for Hodgkin Lymphoma
No studies specifically addressing allo-HCT as first-line treatment for HL were identified.

Relapsed or Refractory Hodgkin Lymphoma
Clinical Context and Therapy Purpose
The purpose of allo-HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with relapsed or refractory HL.

The following PICO was used to select literature to inform this policy.

Populations
The relevant population of interest is individuals with relapsed or refractory HL.

Interventions
The therapy being considered is allo-HCT.

Comparators
Comparators of interest include standard of care.

Outcomes
The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Systematic Reviews
Rashidi et al. (2016) published a systematic review and meta-analysis of studies evaluating allogeneic HCT in Hodgkin Lymphoma. (24) Thirty-eight studies were selected. Three studies included more than 1 series and were divided into more than 1 group; a total of 42 series were included in the meta-analysis. Sample sizes of included studies ranged from 5 to 285 patients (N=1850 patients). Twenty-eight studies were retrospective and 14 prospective. None was an RCT. Median follow-up in the studies ranged from 11 to 104 months. Results of the meta-analyses are shown in Table 3.

Table 3. Meta-Analytic Outcomes

Follow-Up	Relapse-Free Survival (95% CI), %	Overall Survival (95% CI), %
6 months	77 (59 to 91)	83 (75 to 91)
1 year	50 (42 to 57)	68 (62 to 74)
2 years	37 (31 to 43)	58 (52 to 64)
3 years	31 (25 to 37)	50 (41 to 58)

Adapted from Rashidi et al. (2016) (24)
CI: confidence interval.

In multivariate analysis, more recent studies (i.e., those that started to accrue patients in 2000 or later) had significantly higher 6-month and 1-year survival rates than older studies.

Section Summary: Allogeneic Hematopoietic Cell Transplantation for Relapsed or Refractory Hodgkin Lymphoma
A 2016 meta-analysis identified 38 case series evaluating allo-HCT for relapsed or refractory HL. The pooled analysis found a 6-month OS rate of 83% and a 3-year OS rate of 50%.

Allogeneic Hematopoietic Cell Transplantation for Relapsed Hodgkin Lymphoma After Prior Autologous Hematopoietic Cell Transplantation

Clinical Context and Therapy Purpose

The purpose of allo-HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with relapsed HL after an autologous HCT.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with relapsed HL after an autologous HCT.

Interventions

The therapy being considered is allo-HCT.

Comparators

Comparators of interest include standard of care.

Outcomes

The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

The Rashidi et al. (2016) meta-analysis (described above) included 38 case series assessing patients who underwent allogeneic HCT after a prior failed autologous HCT. (24) In a multivariate analysis of factors associated with survival outcomes, reviewers found that a previous autologous HCT was significantly associated with higher 1-year (p=0.012) and 2-year (p=0.040) OS rates and significantly higher relapse-free survival at 1 year (p=0.005) compared with no previous autologous HCT.

Section Summary: Allogeneic Hematopoietic Cell Transplantation for Relapsed Hodgkin Lymphoma After Prior Autologous Hematopoietic Cell Transplantation

A 2016 meta-analysis found that a previous autologous HCT was significantly associated with higher OS rates and significantly higher relapse-free survival rates compared with no previous autologous HCT.

Reduced-Intensity Conditioning with Allogeneic Hematopoietic Cell Transplantation

Clinical Context and Therapy Purpose

The purpose of reduced-intensity conditioning (RIC) with allo-HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with relapsed or refractory HL.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with relapsed or refractory HL.

Interventions

The therapy being considered is RIC with allo-HCT.

Comparators

Comparators of interest include standard of care.

Outcomes

The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Systematic Reviews

Perales et al. (2015) conducted an evidence review as part of the development of clinical guidelines on HCT for HL. (23) Reviewers evaluated a number of studies that showed better outcomes with RIC than with myeloablative conditioning regimens. For example, reviewers cited a 2008 study by the European Group for Blood and Marrow Transplantation reporting outcomes in 89 HL patients with relapsed or refractory disease who received a RIC with allogeneic HCT and were compared with 79 patients who received myeloablative conditioning

(i.e., conventional group). (25) Sixty-two percent of the RIC group had undergone a previous autologous HCT versus 41% of the myeloablative group. Although the incidence of relapse was nearly double in the RIC group (57% versus 30%), after a median follow-up for surviving patients of 75 months (range, 12 to 120 months), 24 in the RIC group (26.9%) and 18 in the conventional group (22.8%) were alive. Five-year OS rates were 28% (95% CI, 18% to 38%) for the RIC group and 22% (95% CI, 13% to 31%) for the conventional group. Independent adverse prognostic factors for OS were a previously failed autologous HCT (relative risk [RR], 1.59; 95% CI, 1.07 to 2.35; p=0.02), the use of myeloablative conditioning (RR=1.62; 95% CI, 1.27 to 3.29; p=0.04), and the presence of refractory disease (RR=1.51; 95% CI, 1.03 to 2.21; p=0.003). Perales et al. (2015) concluded: "As a result, the preferred conditioning intensity in adult patients with relapsed/refractory HL is RIC, which results in acceptable treatment-related mortality including in patients who have had a prior ASCT [autologous stem cell transplant]."

Nonrandomized Study

Sureda et al. (2012) published a phase II study (HDR-ALLO) of allo-HCT after RIC for patients with relapsed or refractory HL. (26) Ninety-two patients were included, of which 90% had received more than 2 lines of therapy, 87% prior radiotherapy, and 86% had failed a previous autologous HCT. Fourteen individuals (15%) progressed under salvage therapy and were excluded from further study treatment. The remaining 78 patients proceeded to allograft (50 were in complete or partial remission and 29 in stable disease). Non-relapse mortality was 8% at 100 days and 15% at 1 year; OS was 71% at 1 year and 43% at 4 years from trial entry. For those who received allo-HCT, PFS was 48% at 1 year and 24% at 4 years. The study was limited by its small sample size and by the non-relapse mortality being adversely influenced by older age, poor performance score, and by the presence of refractory disease.

Section Summary: Reduced-Intensity Conditioning with Allogeneic Hematopoietic Cell Transplantation

A 2015 systematic review assessed a number of studies, including some with comparison groups, showing acceptable outcomes after RIC with allo-HCT in patients with relapsed or refractory HL. A phase II study found slightly improved results for patients receiving RIC and allo-HCT.

Tandem Autologous Hematopoietic Cell Transplantation for Hodgkin Lymphoma

Clinical Context and Therapy Purpose

The purpose of tandem autologous HCT is to provide a treatment option that is an alternative to or an improvement on existing therapies in individuals with HL.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with HL.

Interventions

The therapy being considered is tandem autologous HCT.

Comparators
Comparators of interest include standard of care.

Outcomes
The general outcomes of interest are OS, DSS, change in disease status, morbid events, treatment-related mortality, and treatment-related morbidity.

Follow-up over years is of interest for relevant outcomes.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Nonrandomized Studies
No RCTs have compared tandem autologous HCT with other standard of care therapies. One prospective, nonrandomized study has compared tandem to single autologous HCT for HL. Morschhauser et al. (2008) and Sibon et al. (2016) reported on the results of a prospective multicenter trial that evaluated a risk-adapted salvage treatment with single or tandem autologous HCT in 245 patients with relapsed or refractory HL. (27, 28) Median follow-up time in the initial publication by Morschhauser et al. (2008) was 51 months (range, 20 to 110 months). Sibon et al. (2016) reported on the 10-year follow-up. Patients categorized as poor-risk (n=150), had the primary refractory disease (n=77), or 2 or more of the following risk factors at first relapse: time to relapse less than 12 months, stage III or IV disease at the time of relapse, or relapse in previously irradiated sites (n=73). In this trial, these poor-risk patients were eligible for tandem autologous transplants. Intermediate-risk (n=95) patients, defined as 1 risk factor at relapse, were eligible for a single transplant. Overall, 70% of the poor-risk patients received tandem transplants, and 97% of the intermediate-risk patients received a single transplant.

Ninety-four poor-risk patients responded to cytoreductive chemotherapy (partial response or CR), whereas 55 patients had chemotherapy-resistant disease. A total of 137 patients (including the 94 patients with chemotherapy-sensitive disease and 43 of 55 with chemotherapy-resistant disease) received the first autologous HCT. Among 121 patients who were fully restaged, 64 patients had achieved a CR, 37 a partial response, and 4 had stable disease. These 105 patients then underwent a second autologous HCT after a median of 65 days. Among them, 80 patients achieved a CR, including 17 patients who had achieved partial response and 3 patients with stable disease after the first transplant. Among the 55 patients who had cytoreduction failure,

30 responded to the first transplant (9 with CR), and 17 achieved a CR after the second transplant. Outcome analysis based on the intention-to-treat sample revealed the 5-year freedom from the second failure and OS estimates were 73% and 85% for the intermediate-risk group and 46% and 57% for the poor-risk group, all respectively. At the 10-year follow-up reported by Sibon et al. (2016), (28) freedom from second failure and OS rates were 64% (95% CI, 54% to 74%) and 70% (95% CI, 61% to 80%) for the intermediate-risk group, and 41% (95% CI, 33% to 49%) and 47% (95% CI, 39% to 55%) for the poor-risk group.

In the poor-risk group, patients who underwent tandem transplant and had a CR to cytoreduction chemotherapy did not have superior outcomes compared with complete responders receiving a single transplant in previous studies by the same group. (29) However, in this 2002 study, poor-risk patients who were partial responders and underwent tandem transplants did better compared with partial responders who received a single transplant in previous studies. In this study, 5-year OS rates for poor-risk patients who completed the tandem transplant were 79% and 73% for complete and partial responders, whereas in a previous trial of single autologous HCT, 5-year OS rates were 86% and 37% for complete and partial responders, all respectively. (29) The findings suggested that a single autologous HCT would be appropriate for intermediate-risk patients and for poor-risk patients who are complete responders to cytoreductive chemotherapy but that tandem autologous HCT showed a benefit in patients with chemotherapy-resistant disease and in partial responders to cytoreductive conditioning. The authors concluded that a trial, randomizing patients to single vs tandem autologous HCT was unrealistic, given the low yearly incidence of poor-risk patients. In their estimation, the best possible comparisons would be with data from previous findings with single transplants.

Tandem autologous HCL for HL has also been evaluated in single-arm studies. Fung et al. (2007) reported results from a pilot study on HL that evaluated the toxicities and efficacy of tandem autologous HCT in patients with primary refractory or poor-risk recurrent HL. (30) The study involved 28 patients with primary progressive and 18 with recurrent HL who were enrolled in the study between 1998 and 2000. Patients had at least one of the following poor prognostic factors: first CR less than 12 months, extra-nodal disease, or B symptoms (presence of systemic symptoms) at relapse. Forty-one (89%) patients received the second transplant. With a median follow-up of 5.3 years (range, 1.6 to 8.1 years), the 5-year OS and PFS rates were 54% (95% CI, 40% to 69%) and 49% (95% CI, 34% to 63%), respectively. Additionally, Smith et al. (2018) reported results from a more recent Phase II trial of 89 patients with primary progressive or recurrent HL conducted by the Southwest Oncology Group (SWOG) Clinical Trials Network. (11) This single-arm trial was conducted at 10 centers and enrolled patients between 2006 and 2009. Key patient characteristics included that 53% had induction failure, 18% had an initial response of ≤ 12 months, 83% were stage III or IV at the time of trial enrollment, and 48% previously irradiated patients relapsed in an irradiated site. Eighty-two patients (92%) received the second transplant. With a median follow-up of 6.2 years, the 5-year PFS and OS rates were 55% (95% CI: 44% to 64%) and 84% (95% CI: 74% to 90%).

Section Summary: Tandem Autologous Hematopoietic Cell Transplantation for Hodgkin Lymphoma

There are no RCTs comparing tandem autologous HCT with alternatives for treating HL. One prospective, nonrandomized study reported that patients who had not achieved a CR after conventional chemotherapy had better outcomes with tandem HCT than with single HCT. However, the results of this trial were not definitive, and RCTs are needed to determine the efficacy of tandem transplants.

Summary of Evidence

Autologous Hematopoietic Cell Transplantation

For individuals who have Hodgkin lymphoma (HL) who receive autologous hematopoietic cell transplantation (HCT) as first-line therapy, the evidence includes randomized controlled trials (RCTs). Relevant outcomes are overall survival (OS), disease-specific survival (DSS), change in disease status, morbid events, and treatment-related mortality and morbidity. Randomized controlled trials of autologous HCT as first-line treatment have reported that this therapy does not provide additional benefit compared with conventional chemotherapy. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have relapsed or refractory HL who receive autologous HCT, the evidence includes RCTs, a meta-analysis, nonrandomized studies, and case series. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. Two RCTs in patients with relapsed or refractory disease have reported a benefit in PFS and a trend toward a benefit in OS. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have relapsed HL after an autologous HCT who receive a second autologous HCT, the evidence includes case series. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. No RCTs or nonrandomized comparative studies were identified. In a case series, treatment-related mortality at 100 days was 11%; at a median follow-up of 72 months, the mortality rate was 73%. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Allogeneic Hematopoietic Cell Transplantation

For individuals who have HL who receive allogeneic HCT (allo-HCT) as first-line therapy, the evidence includes no published studies. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. No studies specifically addressing allo-HCT as first-line treatment for HL were identified. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have relapsed or refractory HL who receive allo-HCT, the evidence includes a number of case series and a meta-analysis. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. A 2016 meta-analysis

identified 38 case series evaluating allo-HCT for relapsed or refractory HL. The pooled analysis found a 6-month OS rate of 83% and a 3-year OS of 50%. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have relapsed HL after autologous HCT who receive allo-HCT, the evidence includes case series and a meta-analysis. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. A 2016 meta-analysis of 38 case series found that a previous autologous HCT followed by allo-HCT was significantly associated with higher 1- and 2-year OS rates and significantly higher recurrence-free survival rates at 1 year compared with no previous autologous HCT. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have relapsed or refractory HL who receive reduced-intensity conditioning (RIC) with allo-HCT, the evidence includes case series, cohort studies, and a systematic review. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. A 2015 systematic review cited a number of studies, including some with comparison groups, showing acceptable outcomes after RIC with allo-HCT in patients with relapsed or refractory HL. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

Tandem Autologous Hematopoietic Cell Transplantation

For individuals who have HL who receive tandem autologous HCT, the evidence includes nonrandomized comparative studies and case series. Relevant outcomes are OS, DSS, change in disease status, morbid events, and treatment-related mortality and morbidity. One prospective, nonrandomized study reported that, in patients with poor prognostic markers, response to tandem autologous HCT might be higher than for single autologous HCT. This study was not definitive due to potential selection bias; RCTs are needed to determine the impact of tandem autologous HCT on health outcomes in this population. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Clinical Input From Physician Specialty Societies and Academic Medical Centers

2020

For individuals with relapsed HL after an autologous HCT who receive a second autologous HCT, clinical input does not support a clinically meaningful improvement in net health outcome and does not indicate this use is consistent with generally accepted medical practice.

For individuals with HL who receive tandem autologous HCT, clinical input does not support a clinically meaningful improvement in net health outcome and does not indicate this use is consistent with generally accepted medical practice.

Practice Guidelines and Position Statements

American College of Radiology

In 2016, the American College of Radiology issued an Appropriateness Criteria on recurrent Hodgkin Lymphoma (HL). (31) The criteria stated that while salvage therapy followed by

autologous HCT is standard of care for relapsed HL, alternative therapies may be considered in select patients. For example, there is evidence that in patients with small, isolated relapses occurring more than 3 years after initial presentation, a course of radiotherapy or combined modality therapy without autologous HCT may be considered. Also, radiotherapy may be considered as part of combined modality therapy for patients with local relapse after treatment with chemotherapy alone or for relapses outside of the original site of disease.

American Society for Transplantation and Cellular Therapy

In 2015, guidelines were published by the American Society for Blood and Marrow Transplantation (now referred to as the American Society for Transplantation and Cellular Therapy) on indications for autologous and allogeneic HCT. (32) These guidelines were updated in 2020. (33) Recommendations describe the current consensus on the use of HCT in and out of the clinical trial setting. The 2015 and 2020 Society recommendations on HL are provided in Table 4.

Table 4. Recommendations for Use of HCT to Treat Hodgkin Lymphoma

Indication	Allogeneic HCT (2015 recommendation)	Allogeneic HCT (2020 recommendation)	Autologous HCT (2015 recommendation)	Autologous HCT (2020 recommendation)
Adult				
First complete response (PET negative)	Not generally recommended	Not generally recommended	Not generally recommended	Not generally recommended
First complete response (PET positive)	Not generally recommended	Subsection removed[a]	Standard of care, clinical evidence available	Subsection removed[a]
Primary refractory, sensitive	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Standard of care	Standard of care
Primary refractory, resistant	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Not generally recommended	Not generally recommended
First relapse, sensitive	Standard of care	Standard of care	Standard of care	Standard of care
First relapse, resistant	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Not generally recommended	Not generally recommended
Second or greater relapse	Standard of care, clinical evidence available	Standard of care	Standard of care	Standard of care

Relapse after autologous transplant	Standard of care, clinical evidence available	Standard of care	Not generally recommended	Not generally recommended
Pediatric				
First complete response	Not generally recommended	Not generally recommended	Not generally recommended	Not generally recommended
Primary refractory, sensitive	Standard of care, clinical evidence available	Not generally recommended	Standard of care, clinical evidence available	Standard of care, clinical evidence available
Primary refractory, resistant	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Not generally recommended	Not generally recommended
First relapse, sensitive	Standard of care, clinical evidence available	Not generally recommended	Standard of care, clinical evidence available	Standard of care
First relapse, resistant	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Not generally recommended	Not generally recommended
Second or greater relapse	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Standard of care, clinical evidence available	Standard of care, clinical evidence available

HCT: hematopoietic cell transplantation; PET: positron emission tomography.

[a] Subsection on positron emission tomography positive complete remission was removed because updated response criteria for these lymphoma essentially require normalization of [^{18}F]2-fluoro-2-deoxy-D-glucose positron emission tomography to be assessed as a first complete remission.

In 2015, the Society also published guidelines on the role of cytotoxic therapy with HCT in patients with HL. (23) Select recommendations are shown in Table 5.

Table 5. Recommendations on Use of Cytotoxic Therapy with HCT to Treat Hodgkin Lymphoma

Recommendation	GOR	Highest LOE
Autologous HCT		
Autologous HCT should not be offered as first-line therapy for advanced disease	A	1+
Autologous HCT should be offered as first-line therapy for patients who fail to achieve CR	B	2++
Autologous HCT should be offered as salvage therapy over nontransplantation (except localized disease or in patients with low-stage disease)	A	1+

Autologous HCT should be offered to pediatric patients with primary refractory disease or high-risk relapse who respond to salvage therapy	B	2++
Tandem autologous HCT is not routinely recommended in standard-risk patients	C	2+
Allogeneic HCT		
Allo-HCT should be used for relapse after ASCT instead of conventional therapy	B	2++
RIC is the recommended regimen intensity	B	2++
All donor sources can be considered	A	1+
There are limited data for tandem autologous HCT/allogeneic HCT	D	4
Allo-HCT is preferred over autologous HCT as second HCT (except in late relapse)	C	2+

allo: allogeneic; ASCT: autologous stem cell transplantation; CR: complete response; GOR: grade of recommendation; HCT: hematopoietic cell transplantation; LOE: level of evidence; RIC: reduced-intensity conditioning.

National Comprehensive Cancer Network (NCCN) Guidelines

Current NCCN guidelines for HL (v2.2025) (4) include a recommendation for autologous or allogeneic HCT in patients with biopsy-proven refractory disease who have undergone second line systemic therapy and are Deauville stage 5 according to restaging based on findings from positron emission tomography or computed tomography. Additionally, in patients with biopsy-proven refractory disease who have undergone second-line systemic therapy and are Deauville stage 1 to 3 according to restaging based on findings from positron emission tomography or computed tomography, high-dose therapy and autologous stem cell rescue plus either observation or brentuximab vedotin for 1 year is recommended for patients with high-risk of relapse.

Medicare National Coverage

Autologous HCT is considered reasonable and necessary and is covered under Medicare (NCD 110.23 [formerly 110.8.1]) for patients with "[a]dvanced Hodgkin's disease who have failed conventional therapy and have no HLA [human leukocyte antigen]-matched donor." (34)

Ongoing and Unpublished Clinical Trials:

Some currently ongoing and unpublished trials that might influence this policy are listed in Table 6.

Table 6. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Unpublished			
NCT03200977	Observational Cohort Study to Characterize the Safety of Allogeneic Hematopoietic	95	Dec 2022

	Cell Transplantation (HCT) For Patients With Classical Hodgkin Lymphoma (CHL) Treated With Nivolumab		
NCT00574496	An Intention-to-Treat Study of Salvage Chemotherapy Followed by Allogeneic Hematopoietic Stem Cell Transplant for the Treatment of High-Risk or Relapsed Hodgkin Lymphoma	25	Aug 2022
NCT01203020	Once Daily Intravenous Busulfex as Part of Reduced-toxicity Conditioning for Patients With Relapsed/Refractory Hodgkin's and Non-Hodgkin's Lymphomas Undergoing Allogeneic Hematopoietic Progenitor Cell Transplantation - A Multicenter Phase II Study	22	Sep 2021

NCT: national clinical trial.

[a] Denotes an industry sponsored or cosponsored study

Coding

Procedure codes on Medical Policy documents are included **only** as a general reference tool for each policy. **They may not be all-inclusive.**

The presence or absence of procedure, service, supply, or device codes in a Medical Policy document has no relevance for determination of benefit coverage for members or reimbursement for providers. **Only the written coverage position in a Medical Policy should be used for such determinations.**

Benefit coverage determinations based on written Medical Policy coverage positions must include review of the member's benefit contract or Summary Plan Description (SPD) for defined coverage vs. non-coverage, benefit exclusions, and benefit limitations such as dollar or duration caps.

CPT Codes	36511, 38204, 38205, 38206, 38207, 38208, 38209, 38210, 38211, 38212, 38213, 38214, 38215, 38220, 38221, 38222, 38230, 38232, 38240, 38241, 38242, 38243, 81265, 81266, 81267, 81268, 81370, 81371, 81372, 81373, 81374, 81375, 81376, 81377, 81378, 81379, 81380, 81381, 81382, 81383, 86805, 86806, 86807, 86808, 86812, 86813, 86816, 86817, 86821, 86825, 86826, 86828, 86829, 86830, 86831, 86832, 86833, 86834, 86835, 86849, 86950, 86985, 88240, 88241
HCPCS Codes	S2140, S2142, S2150

*Current Procedural Terminology (CPT®) ©2024 American Medical Association: Chicago, IL.

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Centers for Medicare and Medicaid Services (CMS)

The information contained in this section is for informational purposes only. HCSC makes no representation as to the accuracy of this information. It is not to be used for claims adjudication for HCSC Plans.

The Centers for Medicare and Medicaid Services (CMS) does have a national Medicare coverage position. Coverage may be subject to local carrier discretion.

A national coverage position for Medicare may have been changed since this medical policy document was written. See Medicare's National Coverage at <https://www.cms.hhs.gov>.

Policy History/Revision

Date	Description of Change
06/15/2025	Document updated with literature review. Coverage unchanged. No new references added; some updated.
11/15/2024	Reviewed. No changes.

01/01/2024	Document updated with literature review. No change to coverage. Added/updated the following references: 1, 3, 4, 20, and 32.
05/15/2022	Reviewed. No changes.
12/01/2021	Document updated with literature review. The following change was made to Coverage: Tandem autologous hematopoietic cell transplantation changed to experimental, investigational and/or unproven in patients with Hodgkin lymphoma. CPT code 86822 removed. References 2, 3, 9, 10, 11, 12, 25, 27, 32 added; others updated.
07/01/2020	Document updated with literature review. The following changes were made to Coverage: 1) Modified and split conditional coverage for autologous and allogeneic hematopoietic cell transplantation (HCT) into two separate statements, 2) Removed conditional coverage criteria for non-myeloablative or reduced-intensity allogeneic HCT, and 3) Removed separate EIU statement for allogeneic myeloablative HCT for relapsing Hodgkin lymphoma after autologous HCT, as there is already a broad "including but not limited to" experimental, investigational and/or unproven statement to address clinical scenarios not identified as medically necessary. Added/updated references 1, 3-4; others removed. Title changed from "Hematopoietic Stem-Cell Transplantation for Hodgkin Lymphoma (HL)".
07/15/2018	Document updated with literature review. Coverage unchanged. Rationale reorganized. References 4, 19-20, and 24-26 were added; numerous references removed.
06/01/2017	Reviewed. No changes.
07/15/2016	Document updated with literature review. Coverage unchanged.
07/15/2015	Document updated with literature review. Coverage unchanged. Title changed from Stem-Cell Transplant for Hodgkin Lymphoma.
06/01/2014	Document updated with literature review. The following was changed: 1) Allogeneic stem-cell support (AlloSCS) is considered experimental, investigational and/or unproven as initial therapy for newly diagnosed Hodgkin lymphoma (HL) to consolidate a few complete remission; 2) Autologous stem-cell support (AutoSCS) is considered experimental, investigational and/or unproven to perform a second AutoSCS for relapsed HL; 3) Tandem AutoSCS is considered medically necessary for patients with primary refractory HL or with relapsed disease with poor risks who do not attain CR to cytoreductive chemotherapy prior to transplantation; 4) expanded coverage to consider a) donor leukocyte infusion (DLI) and hematopoietic progenitor cell (HPC) boost as medically necessary for HL that has relapsed following an AlloSCS procedure, to prevent relapse in the setting of a high-risk relapse, or to convert a patient from mixed to full chimerism; b) DLI and HPC boost are considered experimental, investigational and/or unproven following an AlloSCS treatment for HL that was originally considered experimental, investigational and/or unproven for the treatment of HL OR as a treatment prior to AlloSCS; and 5) Expanded

	coverage to consider a) short tandem repeat (STR) markers as medically necessary when used in pre- or post-stem-cell support testing of the donor and recipient DNA profiles as a way to assess the status of donor cell engraftment; b) all other uses of STR markers as experimental, investigational and/or unproven. Description and Rationale significantly revised.
04/01/2010	New medical document originating from: SUR703.017, Peripheral/Bone Marrow Stem Cell Transplantation (PSCT/BMT) for Non-Malignancies; SUR703.018, Peripheral/Bone Marrow Stem Cell Transplantation (PSCT/BMT) for Malignancies; SUR703.022, Cord Blood as a Source of Stem Cells (CBSC); SUR703.023, Donor Leukocyte Infusion (DLI); and SUR703.024, Tandem/Triple High-Dose Chemoradiotherapy with Stem Cell Support for Malignancies. Stem cell transplant continues to be medically necessary when stated criteria are met. [NOTE: A link to the medical policies with the following titles can be found at the end of the medical policy SUR703.002, Stem-Cell Reinfusion or Transplantation Following Chemotherapy (General Donor and Recipient Information): • Peripheral/Bone Marrow Stem Cell Transplantation (PSCT/BMT) for Non-Malignancies; • Peripheral/Bone Marrow Stem Cell Transplantation (PSCT/BMT) for Malignancies; • Cord Blood as a Source of Stem Cells; • Donor Leukocyte Infusion (DLI); and Tandem/Triple High-Dose Chemoradiotherapy with Stem Cell Support for Malignancies.