



Louisiana

Hematopoietic Cell Transplantation for Hodgkin Lymphoma

Policy # 00057

Original Effective Date: 01/28/2008

Current Effective Date: 05/16/2018

Applies to all products administered or underwritten by Blue Cross and Blue Shield of Louisiana and its subsidiary, HMO Louisiana, Inc. (collectively referred to as the "Company"), unless otherwise provided in the applicable contract. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

Note: Hematopoietic Cell Transplantation for Non-Hodgkin Lymphomas is addressed separately in medical policy 00062.

When Services May Be Eligible for Coverage

Coverage for eligible medical treatments or procedures, drugs, devices or biological products may be provided only if:

- *Benefits are available in the member's contract/certificate, and*
- *Medical necessity criteria and guidelines are met.*

Based on review of available data, the Company may consider autologous hematopoietic cell transplantation (HCT) in patients with primary refractory or relapsed Hodgkin lymphoma (HL) to be **eligible for coverage**.

Based on review of available data, the Company may consider allogenic HCT, using either myeloablative or reduced-intensity conditioning (RIC) regimens in patients with primary refractory or relapsed HL to be **eligible for coverage**.

Based on review of available data, the Company may consider tandem autologous HCT to be **eligible for coverage**.

Patient Selection Criteria

Coverage eligibility for tandem autologous HCT will be considered when any of the following criteria are met:

- In patients with primary refractory HL; or
- In patients with relapsed disease with poor risk features who do not attain a complete remission (CR) after cytoreductive chemotherapy prior to transplantation (see Policy Guidelines).

When Services Are Considered Investigational

Coverage is not available for investigational medical treatments or procedures, drugs, devices or biological products.

Based on review of available data, the Company considers tandem autologous HCT to be **investigational*** when patient selection criteria are not met.

Based on review of available data, the Company considers a second autologous cell transplantation for relapsed lymphoma after a prior autologous HCT to be **investigational.***

Other uses of HCT in patients with HL, including, but not limited to, initial therapy for newly diagnosed disease to consolidate a first CR to be **investigational.***

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Policy Guidelines

In the Morschhauser et al (2008) study of risk-adapted salvage treatment with single or tandem autologous HCT for first relapse or refractory HL, poor-risk relapsed HL 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.

Some patients for whom a conventional myeloablative allotransplant could be curative may be considered candidates for RIC allogeneic hematopoietic cell transplantation (allo-HCT). They include those with malignancies that are effectively treated with myeloablative allogeneic transplantation, but whose age (typically >55 or >60 years) or comorbidities (e.g., liver or kidney dysfunction, generalized debilitation, prior intensive chemotherapy, low Karnofsky Performance Status score) preclude the use of a standard myeloablative conditioning regimen.

The ideal allogeneic donors are human leukocyte antigen (HLA)–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 patient, with whom usually there is sharing of only 3 of the 6 major histocompatibility antigens. Most patients 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.

Background/Overview

HODGKIN LYMPHOMA

HL is a relatively uncommon B-cell lymphoma. In 2017, the estimated number of new cases in the United States was approximately 8260 and 1070 estimated deaths. The disease has a bimodal distribution, with most patients diagnosed between the ages of 15 and 30 years, with a second peak in adults aged 55 years and older.

The 2008 World Health Organization classification divides HL into 2 main types:

1. “Classical” HL (CHL)
 - Nodular sclerosis
 - Mixed cellularity
 - Lymphocyte depleted
 - Lymphocyte rich
2. Nodular lymphocyte-predominant HL.

In Western countries, CHL accounts for 95% of cases of HL and, for nodular lymphocyte-predominant HL, only 5%. CHL is characterized by the presence of neoplastic Reed-Sternberg cells in a background of

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numerous non-neoplastic inflammatory cells. Nodular lymphocyte-predominant 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, or drenching night sweats (see Table 1).

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 (IE)
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 (IIE). 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. These patients are further subdivided as follows: <ul style="list-style-type: none"> • III-1: disease limited to spleen or upper abdomen • III-2: periaortic or pelvic node involvement
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-II with no B symptoms or large mediastinal lymphadenopathy), early-stage unfavorable (stage I-II with large mediastinal mass, with or without B symptoms; stage IB-IIB with bulky disease), and advanced-stage disease (stage III-IV).

Treatment

Patients with nonbulky 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. 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.

HL 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

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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 first-line treatment.

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. 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 HCT but not more than 40% with early first relapse.

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.

Hematopoietic Cell Transplantation

HCT is a procedure in which hematopoietic stem cells are infused to restore bone marrow function in cancer patients who receive bone-marrow-toxic doses of drugs with or without whole body radiotherapy. Hematopoietic stem cells may be obtained from the transplant recipient (autologous HCT) or from a donor (allogeneic HCT [allo-HCT]). They can be harvested from bone marrow, peripheral blood, or umbilical cord blood shortly after delivery of neonates. Although cord blood is an allogeneic source, the stem cells in it are antigenically "naive" and thus are associated with a lower incidence of rejection or graft-versus-host disease.

Immunologic compatibility between infused hematopoietic stem cells and the recipient is not an issue in autologous HCT. However, immunologic compatibility between donor and patient is critical for achieving a good outcome with allo-HCT. Compatibility is established by typing of HLA using cellular, serologic, or molecular techniques. HLA refers to the tissue type expressed at the HLA-A, -B, and -DR (antigen-D related) loci on each arm of chromosome 6. Depending on the disease being treated, an acceptable donor will match the patient at all or most of the HLA loci (except umbilical cord blood).

Conditioning for HCT

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 destroy endogenous hematopoietic capability in the recipient. The beneficial treatment effect in 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 that develop after engraftment of allogeneic stem cells within the patient's bone marrow space. While the slower graft-versus-malignancy effect is considered to be the potentially curative component, it may be overwhelmed by extant disease without the use of pretransplant conditioning. However, intense conditioning regimens are limited to patients who are sufficiently fit medically to tolerate substantial adverse events that include preengraftment opportunistic infections secondary to loss of endogenous bone marrow function and organ damage and failure caused by the cytotoxic drugs.

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Furthermore, in any allo-HCT, immunosuppressant drugs are required to minimize graft rejection and graft-versus-host disease, which also increase susceptibility to opportunistic infections.

The success of autologous HCT is predicated on the ability of cytotoxic chemotherapy with or without radiotherapy to eradicate cancerous cells from the blood and bone marrow. This permits subsequent engraftment and repopulation of bone marrow space with presumably normal hematopoietic stem cells obtained from the patient before undergoing bone marrow ablation. Patients who undergo autologous HCT are susceptible to chemotherapy-related toxicities and opportunistic infections before engraftment, but not graft-versus-host disease.

Reduced-Intensity Conditioning for Allo-HCT

RIC refers to the pretransplant use of lower doses or less intense regimens of cytotoxic drugs or radiotherapy than are used in conventional full-dose myeloablative conditioning treatments. The goal of RIC is to reduce disease burden but also to minimize as much as possible associated treatment-related morbidity and nonrelapse mortality in the period during which the beneficial graft-versus-malignancy effect of allogeneic transplantation develops. Although the definition of RIC remains arbitrary, with numerous versions employed, all seek to balance the competing effects of nonrelapse mortality and relapse due to residual disease. RIC regimens can be viewed as a continuum in effects, from nearly totally 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, which may be supplemented with donor lymphocyte infusions to eradicate residual malignant cells.

For this evidence review, the term *RIC* refers to all conditioning regimens intended to be nonmyeloablative, as opposed to fully myeloablative (conventional) regimens.

FDA or Other Governmental Regulatory Approval

U.S. Food and Drug Administration (FDA)

The U.S. 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.

Centers for Medicare and Medicaid Services (CMS)

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-matched donor.”

Rationale/Source

Evidence reviews assess the clinical evidence to determine whether the use of a 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

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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

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. 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, 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. Ten-year overall survival (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 HCT 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 HL

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 in 2014. Reviewers included 3 RCTs, 2 (1993, 2002) of which compared HDC plus autologous HCT with conventional treatment. Both trials (described below) were

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judged to be at moderate risk of bias using the Cochrane criteria. Combined analysis for the outcome of OS demonstrated a hazard ratio 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 hazard ratio of 0.55 (95% CI, 0.35 to 0.86).

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. Forty patients with relapsed or refractory HL were given chemotherapy without transplant (n=20) or autologous HCT after HDC (n=20). 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. Patients relapsing after initial chemotherapy were randomized to chemotherapy without 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 vs 34% in the nontransplanted 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.

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.

Section Summary: Autologous HCT for Relapsed or Refractory HL

RCTs and a meta-analysis have evaluated use of auto-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 HCT for Relapsed HL After Prior Autologous HCT

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

There is limited experience with second autologous HCT, and treatment-related mortality is high (25%-40%). Smith et al (2008) reported on the outcomes of 40 patients (21 with HL, 19 with non-Hodgkin lymphoma) who underwent a second autologous HCT for relapsed lymphoma. Reported results were combined for the 2 populations, but authors stated that the outcomes for both patient groups were similar. Median age at second HCT was 38 years (range, 16-61 years). In 82% of patients, the second HCT was performed more than 1 year after the first. Treatment-related mortality at day 100 posttransplant was 11% (95% CI, 3% to 22%). At a median follow-up of 72 months (range, 12-124 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%

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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 HCT for Relapsed HL After Prior Autologous HCT

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 HCT FOR HL

First-Line Therapy for HL

The application of allogeneic HCT (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.

Section Summary: Allo-HCT as First-Line Therapy for HL

No studies specifically addressing allo-HCT as first-line treatment for HL were identified.

Relapsed or Refractory HL

In 2016, Rashidi et al published a systematic review and meta-analysis of studies evaluating allo-HCT in HL. 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 (total 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 2.

Table 2. 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).

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.

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Section Summary: Allo-HCT for Relapsed or Refractory HL

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%.

Allo-HCT for Relapsed HL After Prior Autologous HCT

The 2016 Rashidi meta-analysis (described above) included 38 case series assessing patients who underwent allo-HCT after a prior failed autologous HCT. 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: Allo-HCT for Relapsed HL After Prior Autologous HCT

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 Allo-HCT

In 2015, Perales et al conducted an evidence review as part of the development of clinical guidelines on HCT for HL. Reviewers evaluated a number of studies that showed better outcomes with RIC and 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 allo-HCT and were compared with 79 patients who received myeloablative conditioning (i.e., conventional group). Sixty-two percent of the RIC group had undergone a previous autologous HCT vs 41% of the myeloablative group. Although the incidence of relapse was nearly double in the RIC group (57% vs 30%), after a median follow-up for surviving patients of 75 months (range, 12-120 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 concluded: "As a result, the preferred conditioning intensity in adult patients with relapsed/refractory HL is RIC, which results in acceptable TRM [treatment-related mortality] including in patients who have had a prior ASCT [autologous stem cell transplant]."

Section Summary: Reduced-Intensity Conditioning With Allo-HCT

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.

TANDEM AUTOLOGOUS HCT FOR HL

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. The study involved 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,

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extranodal 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, 1.6-8.1 years), the 5-year OS and PFS rates were 54% (95% CI, 40% to 69%) and 49% (95% CI, 34% to 63%), respectively.

Morschhauser et al (2008) 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. Median follow-up time was 51 months (range, 20-110 months). 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 or complete response), whereas 55 patients had the chemotherapy-resistant disease. A total of 137 patients (including the 94 patients with chemotherapy-sensitive disease and 43 of 55 with the chemotherapy-resistant disease) received the first autologous HCT. Among 121 patients who were fully restaged, 64 patients had achieved a complete response, 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 complete response, 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 complete response), and 17 achieved a complete response after the second transplant. Outcome analysis based on the intention-to-treat sample revealed that the 5-year freedom from 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.

In the poor-risk group, patients who underwent tandem transplant and had a CR to cytoreductive chemotherapy did not have superior outcomes compared with complete responders receiving a single transplant in previous studies. 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. 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.

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Section Summary: Tandem Autologous HCT for HL

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 HCT

For individuals who have HL who receive autologous HCT as first-line therapy, the evidence includes RCTs. Relevant outcomes are OS, disease-specific survival, change in disease status, morbid events, and TRM and morbidity. RCTs 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 the effects of the technology on health outcomes.

For individuals who have relapsed or refractory HL who receive autologous HCT, the evidence includes RCTs, a meta-analysis, nonrandomized comparative studies, and case series. Relevant outcomes are OS, disease-specific survival, change in disease status, morbid events, and TRM 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 a meaningful 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, disease-specific survival, change in disease status, morbid events, and TRM and morbidity. No RCTs or nonrandomized comparative studies were identified. In a case series, TRM at 100 days was 11%; at a median follow-up of 72 months, the mortality rate was 73%. The evidence is insufficient to determine the effects of the technology on health outcomes.

Allo-HCT

For individuals who have HL who receive allo-HCT as first-line therapy, the evidence includes no published studies. Relevant outcomes are OS, disease-specific survival, change in disease status, morbid events, and TRM and morbidity. No studies specifically addressing allo-HCT as first-line treatment for HL were identified. The evidence is insufficient to determine the effects of the technology on health outcomes.

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, disease-specific survival, change in disease status, morbid events, and TRM 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 rate of 50%. The evidence is sufficient to determine that the technology results in a meaningful 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, disease-specific survival, change in disease

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status, morbid events, and TRM 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 a meaningful improvement in the net health outcome.

For individuals who have relapsed or refractory HL who receive RIC with allo-HCT, the evidence includes case series, cohort studies, and a systematic review. Relevant outcomes are OS, disease-specific survival, change in disease status, morbid events, and TRM 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 a meaningful improvement in the net health outcome.

Tandem Autologous HCT

For individuals who have HL who receive tandem autologous HCT, the evidence includes nonrandomized comparative studies and case series. Relevant outcomes are OS, disease-specific survival, change in disease status, morbid events, and TRM and morbidity. One prospective, nonrandomized study reported that, in patients with poor prognostic markers, response to tandem autologous HCT might be higher than that 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 the effects of the technology on health outcomes.

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12/06/2001	Medical Policy Committee review
03/25/2002	Managed Care Advisory Council approval
06/24/2002	Format revision. No substance change to policy.
05/07/2004	Medical Director review

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05/18/2004 Medical Policy Committee review. Format revision. High-Dose Chemotherapy and Hematopoietic Stem Cell Support for Hodgkin's Disease policy developed separately from current HDC with Hematopoietic Stem Cell Support policy.

06/28/2004 Managed Care Advisory Council approval

05/03/2005 Medical Director review

05/17/2005 Medical Policy Committee review. Coverage eligibility unchanged.

05/23/2005 Managed Care Advisory Council approval

05/03/2006 Medical Director review

05/17/2006 Medical Policy Committee approval. Format revision, including addition of FDA and or other governmental regulatory approval and rationale/source. Coverage eligibility unchanged.

04/04/2007 Medical Director review

04/18/2007 Medical Policy Committee approval. No change in coverage eligibility.

04/02/2008 Medical Director review

04/16/2008 Medical Policy Committee approval. No change to coverage eligibility.

04/02/2009 Medical Director review

04/15/2009 Medical Policy Committee approval. Title changed to match BCBSA. No change to coverage.

04/08/2010 Medical Policy Committee approval

04/21/2010 Medical Policy Implementation Committee approval. Added tandem autologous HSCT to be eligible for coverage with criteria. Added reduced-intensity allogeneic HSCT to treat Hodgkin Lymphoma to be eligible for coverage with criteria. Added that a second autologous stem-cell transplantation for relapsed lymphoma after a prior autologous HSCT to be investigational. Updated background/overview, rationale and references.

04/07/2011 Medical Policy Committee review

04/13/2011 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

04/12/2012 Medical Policy Committee review

04/25/2012 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

05/02/2013 Medical Policy Committee review

05/22/2013 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

05/01/2014 Medical Policy Committee review

05/21/2014 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

05/07/2015 Medical Policy Committee review

05/20/2015 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

08/03/2015 Coding update: ICD10 Diagnosis code section added; ICD9 Procedure code section removed.

05/05/2016 Medical Policy Committee review

05/18/2016 Medical Policy Implementation Committee approval. Coverage eligibility unchanged

01/01/2017 Coding update: Removing ICD-9 Diagnosis Codes

05/04/2017 Medical Policy Committee review

05/17/2017 Medical Policy Implementation Committee approval. "Stem" removed from title and policy. Removed statement on reduced intensity allogeneic HCT, added coverage statement for allogeneic HCT, using either myeloablative or reduced-intensity conditioning regimens in patients with primary refractory or relapsed Hodgkin lymphoma. Added a policy guidelines section.

05/03/2018 Medical Policy Committee review

05/16/2018 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

Next Scheduled Review Date: 05/2019

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HCPCS	S2140, S2142, S2150
ICD-10 Diagnosis	C81.00-C81.99

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- B. Clinically appropriate, in terms of type, frequency, extent, level of care, site and duration, and considered effective for the patient's illness, injury or disease; and
- C. Not primarily for the personal comfort or convenience of the patient, physician or other health care provider, and not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient's illness, injury or disease.

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