Hematopoietic Stem-Cell Transplantation in the Treatment of Germ Cell Tumors (GCT)

Policy Number: 8.01.35  Last Review: 7/2014

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will provide coverage for hematopoietic stem-cell transplantation in the treatment of germ cell tumors when it is determined to be medically necessary because the criteria shown below are met.

When Policy Topic is covered
Single autologous hematopoietic stem-cell transplantation may be considered medically necessary as salvage therapy for germ-cell tumors:
- in patients with favorable prognostic factors that have failed a previous course of conventional-dose salvage chemotherapy; or
- in patients with unfavorable prognostic factors as initial treatment of first relapse (i.e., without a course of conventional-dose salvage chemotherapy) and in patients with platinum-refractory disease. (See Considerations section for prognostic factors.)

Tandem or sequential autologous hematopoietic stem-cell transplantation may be considered medically necessary for the treatment of testicular tumors either as salvage therapy or with platinum-refractory disease.

When Policy Topic is not covered
Autologous hematopoietic stem-cell transplantation is considered investigational as a component of first-line treatment for germ-cell tumors.

Allogeneic hematopoietic stem-cell transplantation is considered investigational to treat germ-cell tumors, including, but not limited to its use as therapy after a prior failed autologous hematopoietic stem-cell transplantation.

Considerations
The favorable and unfavorable prognostic factors listed below are derived from the current National Comprehensive Cancer Network (NCCN) guidelines (1) and the Devita, Hellman, and Rosenberg’s textbook Cancer Principles and Practice of Oncology. (2)

Patients with favorable prognostic factors include those with a testis or retroperitoneal primary site, a complete response to initial chemotherapy, low levels of serum markers and low volume disease. Patients with unfavorable prognostic factors are those with an incomplete response to initial therapy or relapsing mediastinal nonseminomatous germ-cell tumors.

Reimbursement for Stem Cell collection and storage are considered payable under the Transplant Benefit when billed as a one-time, all-inclusive charge.
Transplant Benefit
The date on which the Transplant Benefit starts accumulating is determined by the transplant coordinator. The Transplant Benefit ends when the Transplant Lifetime Maximum benefit (if applicable) has been exhausted.

Benefits include:
- hospitalization of the recipient for medically recognized transplants from a donor to a transplant recipient;
- evaluation tests requiring hospitalization to determine the suitability of both potential (member's benefits must be verified with regard to the potential donor who does not turn out to be the actual donor) and actual donors, when such tests cannot be safely and effectively performed on an outpatient basis (Note: The member's benefits must be verified with regard to the potential donor who does not turn out to be the actual donor.);
- hospital room, board and general nursing in semi-private rooms;
- special care units, such as coronary and intensive care;
- hospital ancillary services;
- physicians' services for surgery, technical assistance, administration of anesthetics, and medical care;
- acquisition, preparation, transportation, and storage of organ / tissue / cells;
- diagnostic services;
- drugs which require a prescription by federal law;
- medical and surgical care of the donor (related to the procurement of the organ / tissue / cells) if coverage is not available to the donor from any other source. (Covered services provided to a donor will be applied against the recipient's transplant maximum benefit, if applicable)

If the donor and recipient are both listed on the same (family) policy, BCBSKC charges only one deductible and one coinsurance, if applicable.

In addition to the specific organ criteria, transplant candidates must also meet the following general criteria, including, but not limited to:
- Since compliance is a major factor in transplant graft survival, the patient (or legal guardian) must have the ability to accept and understand the transplant procedure and to maintain compliance with long-term medical management and immunosuppression.
- If applicable, patients with a history of malignancy must have passed the recommended length of time to be considered cured for that specific cancer. A complete metastatic evaluation must be performed before a patient will be considered an acceptable transplant candidate.
- Patients with a history of alcohol or substance abuse must have a six month history of abstinence as evidenced by negative urine or serum drug screens taken randomly.
- The patient must have adequate cardiopulmonary status.
- The patient must be free from active infection.

A covered person is eligible for retransplantation as deemed medically necessary and appropriate by BCBSKC. Review of a retransplantation request will include review of the covered person’s compliance with relevant transplant selection criteria including, but not limited to, adherence to medication regimens, follow-up examinations and abstinence from the use of alcohol and drugs.

Coverage will not be provided for:
- Transplant services when the cost is covered by government, foundation or charitable grants
- The purchase price of organs which are sold rather than donated to the recipient.
- An artificial organ

Clinical trials for conditions other than those allowed in this policy may be available in the research setting. However, these trials are considered investigational and/or experimental and therefore contract exclusions.
Note: There are some state mandates in place that require insurance carriers to cover certain clinical trials under very specific guidelines. Please contact your BCBSKC representative for more information.

**Description of Procedure or Service**
Therapy for germ-cell tumors is generally dictated by several factors, including disease stage, tumor histology, site of tumor primary and response to chemotherapy. Patients with unfavorable prognostic factors may be candidates for hematopoietic stem-cell transplantation (HSCT).

**Hematopoietic Stem-Cell Transplantation**
Hematopoietic stem-cell transplantation (HSCT) refers to a procedure in which hematopoietic stem cells are infused to restore bone marrow function in cancer patients who receive bone-marrow-toxic doses of cytotoxic drugs with or without whole body radiation therapy. Hematopoietic stem cells may be obtained from the transplant recipient (autologous HSCT) or from a donor (allogeneic HSCT). 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 “naïve” and thus are associated with a lower incidence of rejection or graft-versus-host disease (GVHD). Cord blood is discussed in greater detail in a separate policy.

Immunologic compatibility between infused hematopoietic stem cells and the recipient is not an issue in autologous HSCT. However, immunologic compatibility between donor and patient is a critical factor for achieving a good outcome of allogeneic HSCT. Compatibility is established by typing of human leukocyte antigens (HLA) using cellular, serologic, or molecular techniques. HLA refers to the tissue type expressed at the Class I and Class II loci on chromosome 6. Depending on the disease being treated, an acceptable donor will match the patient at all or most of the HLA loci (with the exception of umbilical cord blood).

**Conventional Preparative Conditioning for HSCT**
The success of autologous HSCT is predicated on the ability of cytotoxic chemotherapy with or without radiation 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 prior to undergoing bone marrow ablation. As a consequence, autologous HSCT is typically performed as consolidation therapy when the patient’s disease is in complete remission. Patients who undergo autologous HSCT are susceptible to chemotherapy-related toxicities and opportunistic infections prior to engraftment, but usually not GVHD.

The conventional (“classical”) practice of allogeneic HSCT 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 (GVM) 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 GVM 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 effects that include pre-engraftment opportunistic infections secondary to loss of endogenous bone marrow function and organ damage and failure caused by the cytotoxic drugs. Furthermore, in any allogeneic HSCT, immune suppressant drugs are required to minimize graft rejection and GVHD, which also increases susceptibility of the patient to opportunistic infections.

**Reduced-Intensity Conditioning for Allogeneic HSCT**
Reduced-intensity conditioning (RIC) refers to the pretransplant use of lower doses or less intense regimens of cytotoxic drugs or radiation than are used in traditional 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 (NRM) in the period during which the
beneficial GVM effect of allogeneic transplantation develops. Although the definition of RIC remains arbitrary, with numerous versions employed, all seek to balance the competing effects of NRM 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 allogeneic HSCT 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 the purposes of this Policy, the term “reduced-intensity conditioning” will refer to all conditioning regimens intended to be non-myeloablative, as opposed to fully myeloablative (traditional) regimens.

**Germ-Cell Tumors**

Germ-cell tumors are composed primarily of testicular neoplasms (seminomas or nonseminomatous tumors) but also include ovarian and extragonadal germ-cell tumors (e.g., retroperitoneal or mediastinal tumors). Germ-cell tumors are classified according to their histology, stage, prognosis, and response to chemotherapy.

Histologies include seminoma, embryonal carcinoma, teratoma, choriocarcinoma, yolk sac tumor, and mixed germ-cell tumors. Seminomas are the most common; all other types are collectively referred to as nonseminomatous germ-cell tumors.

Stage is dependent on location and extent of the tumor, using the American Joint Committee on Cancer’s TNM system. TNM stages, modified by serum concentrations of markers for tumor burden (S0-3) when available, are grouped by similar prognoses. Markers used for germ-cell tumors include human beta-chorionic gonadotropin (HCG), lactate dehydrogenase (LDH), and alpha fetoprotein (AFP). However, most patients with pure seminoma have normal AFP concentrations. For testicular tumors, Stages IA-B have tumors limited to the testis (no involved nodes or distant metastases) and no marker elevations (S0); Stages IIA-C have increasing size and number of tumor-involved lymph nodes, and at least one marker moderately elevated above the normal range (S1); and Stages IIIA-C have distant metastases and/or marker elevations greater than specified thresholds (S2-3).

Germ-cell tumors also are divided into good-, intermediate-, or poor-risk categories based on histology, site, and extent of primary tumor, and on serum marker levels. Good-risk pure seminomas can be at any primary site, but are without nonpulmonary visceral metastases or marker elevations. Intermediate-risk pure seminomas have nonpulmonary visceral metastases with or without elevated HCG and/or LDH. There are no poor-risk pure seminomas, but mixed histology tumors and seminomas with elevated AFP (due to mixture with nonseminomatous components) are managed as nonseminomatous germ-cell tumors. Good- and intermediate-risk nonseminomatous germ-cell tumors have testicular or retroperitoneal tumors without nonpulmonary visceral metastases, and either S1 (good risk) or S2 (intermediate) levels of marker elevations. Poor-risk tumors have mediastinal primary tumors, or nonpulmonary visceral metastases, or the highest level (S3) of marker elevations.

Therapy for germ-cell tumors is generally dictated by stage, risk subgroup, and tumor histology. Testicular cancer is divided into seminomatous and nonseminomatous types for treatment planning because seminomas are more sensitive to radiation therapy. Stage I testicular seminomas may be treated by orchiectomy with or without radiation or single-dose carboplatin adjuvant therapy. Nonseminomatous stage I testicular tumors may be treated with orchiectomy with or without retroperitoneal lymph node dissection. Higher stage disease typically involves treatment that incorporates chemotherapy. First-line chemotherapy for good- and intermediate-risk patients with higher-stage disease is usually 3 or 4 cycles of a regimen combining cisplatin and etoposide, with or without bleomycin depending on histology and risk group. Chemotherapy is often followed by surgery to remove residual masses. Second-line therapy often consists of combined therapy with ifosfamide/mesna and cisplatin, plus vinblastine, paclitaxel, or etoposide (if not used for first-line treatment). Patients whose tumors are resistant to cisplatin may receive carboplatin-containing...
regimens. The probability of long-term continuous complete remission diminishes with each successive relapse.

**Rationale**

This policy was created in April 2000 and updated periodically with literature searches of the Medline database. The most recent literature review was performed through March 5, 2014.

**Literature Review**

**Autologous hematopoietic stem-cell transplantation as first-line therapy of germ-cell tumors**

Daugaard et al reported the outcomes of a randomized phase 3 study comparing standard-dose BEP (cisplatin, etoposide, bleomycin) to sequential high-dose VIP (cisplatin, etoposide, ifosfamide) plus stem-cell support in previously untreated males with poor-prognosis germ-cell cancer. The study aimed to recruit 222 patients but closed with 137 patients from 27 European oncology centers due to slow accrual. Patients were age 15 to 50 years and had previously untreated metastatic poor-prognosis nonseminomatous germ-cell tumor of either testicular or extragonadal origin. Median follow-up was 4.4 years. Toxicity was more severe in the patients who received high-dose chemotherapy (HDC), and toxic death was reported in 2 patients who received HDC and 1 in the BEP arm. There was no improvement in complete response (CR) rate in the HDC arm versus the standard-dose arm (44.6% vs 33.3%, respectively, p=0.18). There was no difference in failure-free survival (FFS) between the 2 groups. At 2 years, FFS was 44.8% (95% confidence interval [CI], 32.5 to 56.4) and 58.2% (95% CI, 48.0-71.9), respectively, for the standard- and high-dose arms. The difference was not statistically significant (p=0.06). OS did not differ between the 2 groups (log-rank p>0.1). The authors concluded that HDC given as part of first-line therapy does not improve outcomes in patients with poor-prognosis germ-cell tumor.

Motzer et al reported on a phase 3 prospective, randomized, multicenter trial of 219 previously untreated patients with poor-prognosis germ-cell tumors. Patients were randomized to receive either conventional chemotherapy (4 cycles of BEP) (n=111), or 2 cycles of BEP followed by 2 cycles of HDC with autologous HSCT. Median follow-up was 51 months. One-year durable CR rate was 52% after BEP and HDC with HSCT, and 48% after BEP alone (p=0.53). There was no survival difference at 106 months for patients treated with HDC and HSCT compared with patients treated with conventional chemotherapy (68% and 69%, respectively).

Droz et al assessed the impact of HDC with HSCT on the survival of patients with high-volume, previously untreated, metastatic nonseminomatous germ-cell tumors. Patients were randomized to 4 cycles every 21 days of vinblastine, etoposide, cisplatin and bleomycin (n=57) or a slightly modified regimen followed by HDC and autologous HSCT (n=57). In an intention-to-treat (ITT) analysis, there were 56% and 42% CRs in the conventional and HDC groups, respectively (p=0.099). Median follow-up was 9.7 years, and no significant difference between OS was observed (p=0.167).

Overall, the evidence from multiple randomized trials indicates that autologous HSCT is not superior to alternative therapy as initial therapy for germ-cell tumors.

**Autologous HSCT for relapsed or refractory germ-cell tumors**

The evidence related to the use of autologous HSCT for relapsed or treatment-refractory germ-cell tumors consists of 1 randomized controlled trial (RCT) and several nonrandomized observational studies.

In 2005, Pico et al reported on a randomized trial comparing 4 cycles of conventional-dose chemotherapy with 3 cycles of the same regimen followed by carboplatin-based HDC plus autologous HSCT in 280 patients who had relapsed after a complete or partial remission following first-line therapy with a cisplatin-based regimen. The authors reported no significant differences between treatment
arms in 3-year EFS and OS. However, the study began before international consensus(7) established the current risk group definitions; thus, Pico et al likely included some patients now considered to have good prognosis at relapse. Furthermore, while 77% and 86% of patients in the control and experimental arms, respectively, had at least 1 elevated serum tumor marker, they did not report how highly elevated these were and did not compare arms with respect to the marker thresholds that presently determine risk level (S1-3). Finally, HDC in the experimental arm followed 3 cycles of conventional-dose chemotherapy, which differs from most current practice in the U.S., in which a single cycle is used before HDC. As a consequence, 38 of 135 (28%) randomized to the HDC arm did not receive HDC because of progression, toxicity, or withdrawal of consent.

Seftel et al conducted a multicenter cohort study of consecutive patients undergoing a single autologous HSCT for germ-cell tumor between January 1986 and December 2004.(8) Of 71 subjects, median follow-up was 10.1 years. The median age was 31 years (range, 16-58 years). A total of 67 of the patients had nonseminomatous germ-cell tumors and 4 had seminomatous germ-cell tumors. A total of 57 patients had primary gonadal disease and 14 had primary extragonadal disease. Of the latter, 11 patients presented with primary mediastinal disease, 2 presented with primary central nervous system (CNS) disease, and 1 presented with retroperitoneal disease. In all, 28 patients underwent autologous HSCT for relapsed disease after achieving an initial CR. Of these, 24 patients underwent autologous HSCT after a first relapse, whereas 4 patients underwent transplant after a second relapse. An additional 36 patients achieved only an incomplete response after initial therapy and proceeded to autologous HSCT after salvage chemotherapy for active residual disease. OS at 5 years was 44.7% (95% CI, 32% to 56.5%) and EFS, 43.5% (95% CI, 31.4% to 55.1%). There were 7 (10%) treatment-related deaths within 100 days of transplant. Three (4.2%) patients developed secondary malignancies. Of 33 relapses, 31 occurred within 2 years of the transplant. Two very late relapses occurred 13 and 11 years after transplant. In a multivariate analysis, a favorable outcome was associated with International Germ Cell Consensus Classification (IGCCC) good prognosis disease at diagnosis, primary gonadal disease, and response to salvage chemotherapy.

Agarwal et al reported their experience at Stanford in treating 37 consecutive patients who received HDC and autologous HSCT between 1995 and 2005 for relapsed germ-cell tumors.(9) The median patient age was 28 years (range, 9-59 years), with 34 males and 3 females. Primary tumor sites included 24 testes/adnexal, 10 chest/neck/retroperitoneal, and 3 CNS. Twenty-nine of the patients had received prior standard salvage chemotherapy. Three-year OS was 57% (95% CI, 41% to 71%), and 3-year PFS was 49% (95% CI, 33% to 64%).

Baek et al reported results of a small feasibility study of HDC followed by HSCT for patients with nongerminomatous (ie, nonseminomatous) germ-cell tumors and 9 patients with germinomatous stem-cell tumors, all of whom had received conventional chemotherapy with or without radiation before HSCT. Sixteen patients received an initial course of HDC with carboplatin, thiopental, and etoposide followed by HSCT, and 9 of those received a second course of HDC with cyclophosphamide-melphalan followed by a second HSCT (see "Tandem and sequential HSCT for germ-cell tumors," next). Twelve patients remained alive at a median follow-up of 47 months (range, 22-90 months), with a probability of 3-year OS of 59.1%±11.2%.

Tandem and sequential HSCT for germ-cell tumors

There is ongoing research into the role of tandem and sequential HSCT for germ-cell tumors, with a variety of specific chemotherapy regimens.

Lorch et al compared single- versus sequential HDC with autologous HSCT as first or subsequent salvage treatment in patients with relapsed or refractory germ-cell tumors.(11) Between November 1999 and November 2004, patients planned to be recruited in a prospective, randomized, multicenter trial comparing 1 cycle of VIP plus 3 cycles of high-dose carboplatin and etoposide (CE [arm A]) versus 3 cycles of VIP plus 1 cycle of high-dose carboplatin, etoposide and cyclophosphamide (CEC [arm B]).
Most of the tumors were gonadal primaries; 10% of patients in arm A had retroperitoneal, mediastinal or CNS primaries, and 11% of patients in arm B had retroperitoneal or mediastinal primaries. This represented the first salvage therapy received in 86% of the patients in arm A and 85% in arm B, whereas 14% (arm A) and 15% (arm B) had received 1 or more previous salvage regimens before randomization. A total of 111 (51%) of 216 patients were randomly assigned to sequential high-dose therapy, and 105 (47%) of 216 patients were randomly assigned to single high-dose therapy. The study was stopped prematurely after recruitment of 216 patients as a result of excess treatment-related mortality in arm B. There was a planned interim analysis after the inclusion of 50% of the required total number of patients. Survival analyses were performed on an ITT basis.

With a median follow-up time of 36 months, 109 (52%) of 211 patients were alive, and 91 (43%) of 211 patients were progression-free. At 1 year, EFS, PFS, and OS rates were 40%, 53%, and 80%, respectively, in arm A compared with 37%, 49%, and 61%, respectively, in arm B (p>0.05 for all comparisons). Survival rates were not reported separately by primary site of the tumor. No difference in survival probabilities was found between the single and sequential high-dose regimens; however, sequential high-dose therapy was better tolerated and resulted in fewer treatment-related deaths. Treatment-related deaths, mainly as a result of sepsis and cardiac toxicity, were less frequent in arm A (4/108 patients, 4%) compared with arm B (16/103 patients, 16%; p<0.01). The authors state that the higher treatment-related deaths observed in arm B likely were due to the higher dosages per HSCT cycle in the arm B regimen compared with arm A, and the toxic renal and cardiac effects of cyclophosphamide used in arm B. The authors conclude that sequential treatment at submaximal doses of carboplatin and etoposide might be less toxic and safer to deliver HSCT in pretreated patients with germ-cell tumors than single HSCT.

Long-term results from this study reported 5-year PFS as 47% (95% CI, 37% to 56%) in arm A and 45% (95% CI, 35% to 55%) in arm B (hazard ratio [HR], 1.16; 95% CI, 0.79 to 1.70; p=.454). Five-year OS was 49% (95% CI, 40% to 59%) in arm A and 39% (95% CI, 30% to 49%) in arm B (HR=1.42; 95% CI, 0.99 to 2.05; p=.057). The authors concluded that patients with relapsed or refractory germ-cell tumors can achieve durable long-term survival after single, as well as sequential HSCT and that fewer early deaths related to toxicity translated into superior long-term OS after sequential HSCT.(12)

Lazarus et al reported the results of autologous HSCT in relapsed testicular/germ-cell cancer from registry data from the Center for International Blood and Marrow Transplant Research.(13) Patients with mediastinal primaries were excluded. Data included 300 patients from 76 transplant centers in 8 countries who received either a single transplant or tandem autologous HSCT between 1989 and 2001. Of the 300 patients, 102 received tandem, and 198 single planned autologous HSCT. PFS and OS at 1, 3, and 5 years was similar for both groups. The probability of PFS at 5 years for the tandem transplant group was 34% (95% CI, 25% to 44%) versus 38% (95% CI, 31% to 45%) in the single transplant group; p=0.50. The probability of 5-year OS was 35% (95% CI, 25% to 46%) versus 42% (95% CI, 35% to 49%), respectively (p=0.29).

Lotz et al reported the results of a phase 2 study on 3 consecutive cycles of HDC regimens supported by autologous HSCT in 45 poor-prognosis patients with relapsed germ-cell tumors.(14) From March 1998 to September 2001 (median follow-up, 31.8 months), 45 patients (median age, 28 years) were enrolled. Most of the patients (76%) had testicular primaries; 13% had mediastinal primaries; 11% retroperitoneal, hepatic, or unknown. Of all patients, 22 received the complete course. Twenty-five patients died from progression and 5 from toxicity. The overall response rate was 37.7%, including an 8.9% CR rate. The median OS was 11.8 months. The 3-year survival and PFS rate was 23.5%. The authors used the “Beyer” prognostic score to predict the outcome of HDC and concluded that patients with a Beyer score greater than 2 did not benefit from this approach, confirming that highly refractory patients and particularly patients with resistant/refractory primary mediastinal germ-cell tumors do not benefit from HDC. The authors also state that better selection criteria have to be fulfilled in forthcoming studies.
Einhorn et al reported retrospectively on a series of 184 patients, treated between 1996 and 2004, with 2 consecutive cycles of HDC for metastatic testicular cancer that had progressed (relapsed) after receiving cisplatin-containing combination chemotherapy. Patients with primary mediastinal nonseminomatous germ-cell tumors or tumors with late relapse (2 or greater years after previous therapy) were excluded. The patient population included those with initial IGCCC stage defined as low risk (39%), intermediate risk (21%), and high risk (41%) and both platinum-sensitive and refractory disease at the beginning of HDC. Results from this experienced center showed that of the 184 patients, 116 had complete remission of disease without relapse during a median follow-up of 48 months. Of the 135 patients who received the treatment as second-line therapy (ie, first salvage setting), 94 (70%) were disease-free during follow-up; 22 (45%) of 49 patients who received treatment as third-line or later therapy were disease-free. Of 40 patients with cancer that was refractory to standard-dose platinum, 18 (45%) were disease-free.

Letters to the editor regarding the Einhorn et al study noted the lack of a validation set for the prognostic scoring system used in the study, the unanswered question of the role of high-dose versus conventional-dose chemotherapy in the first salvage setting, and the lack of a universally accepted prognostic scoring system in this setting.

In a subsequent study from the same center as the Einhorn et al study, Suleiman et al evaluated the outcomes for 12 patients with recurrent primary mediastinal nonseminomatous germ-cell tumors after initial treatment with cisplatin-containing combination chemotherapy, a population excluded from their previous study, who were treated with tandem HSCT. Patients received 2 consecutive courses of HDC (carboplatin and etoposide) followed by HSCT. Overall outcomes were poor, with a median survival of 11 months (range, 4-52 months), but 3 of 12 patients achieved a complete remission. One patient remained free of disease at 50 months of follow up, and 1 remained free of disease after tandem HSCT and subsequent mediastinal surgery at 52 months of follow-up.

Pal et al reported 5-year follow up results from a retrospective case series of 48 patients with relapsed germ-cell tumors who were enrolled in a study to evaluate the effectiveness of 2 sequential cycles of HDC (paclitaxel, etoposide, and carboplatin in the first cycle, followed by dose of high-dose paclitaxel, ifosfamide, and carboplatin) followed by HSCT. Forty-three patients (91.5%) had nonseminomatous histology. Most patients (n=39) had received 2 prior chemotherapy regimens; 6 patients had received 3 prior regimens. Thirty-four patients had intermediate risk classification by the Beyer score and the remainder had high risk classification. Of the 48 patients enrolled, 17 received only 1 course of HDC, 11 due to progressive disease, 5 due to toxicities, and 1 due to a severe fungal infection. A total of 17 patients of the 48 enrolled were alive and progression-free at a median of 123.2 months (range, 51.6-170.2 months); 25 died, most (n=23) due to disease progression. Of the 23 patients who were alive after receiving per-protocol therapy, 18 were contacted for interviews at a median 115.6 months (range, 38.9-185.9 months) postenrollment and underwent a cancer-related quality-of-life assessment with the European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire–Core 30 (QLQ-C30). The overall average score on the questionnaire was 87.04 (SD=14.64); the authors compared quality-of-life scores in this cohort to a separate cohort of 150 patients with germ-cell tumors who received chemotherapy, and reported that patients in their cohort had significantly higher global health scores (87.04 vs 75.62, p=0.02), but lower physical functioning scores (68.9 vs 92.7, p<0.001). The authors conclude that tandem HDC followed by HSCT is a reasonable option for relapsed germ-cell tumors, with long-term survivors demonstrating a reasonable quality of life.

A comparative effectiveness review conducted for the Agency for Healthcare Research and Quality on the use of HSCT in the pediatric population concluded that, for germ-cell tumors, the body of evidence on OS with tandem HSCT compared with single HSCT for the treatment of relapsed pediatric germ-cell tumors was insufficient to draw conclusions.
There are scant data in the literature to support the use of allogeneic HSCT in the treatment of germ-cell tumors.(19)

**Clinical Input Received Through Physician Specialty Societies and Academic Medical Centers**

In response to requests, input was received from 3 physician specialty societies, 3 academic medical centers, and 5 Blue Distinction Centers for Transplants® while this policy was under review for March 2010. While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted. There was general agreement with the policy statements regarding the use of single autologous HSCT as salvage therapy, the use of autologous HSCT as first-line treatment, and the use of allogeneic HSCT. Seven of the reviewers felt that tandem or sequential HSCT is medically necessary for patients as salvage therapy or with platinum-refractory disease; 2 reviewers felt that tandem or sequential HSCT was investigational; 2 stated that commenting on this was beyond his/her area of expertise.

**Summary**

Salvage therapy plays a role in patients with germ-cell tumors who are either refractory to cisplatin or who relapse after initial treatment. The timing for the use of high-dose chemotherapy (HDC) and hematopoietic stem-cell transplantation (HSCT) instead of standard salvage chemotherapy is less well defined, with patient heterogeneity playing a role in the overall outcome. Studies have been limited trying to stratify patients into various prognostic groups to identify those who are high-risk, as only 30% of patients with germ-cell tumors require salvage treatment. The use of HDC and HSCT as first-line therapy has not been shown to be superior to standard chemotherapy; HSCT remains the treatment of choice for patients who fail standard salvage therapy.

The role of tandem or sequential autologous transplants in relapsed disease has been investigated in 1 phase II study, 1 randomized study, several retrospective series, and a comparative effectiveness review for the Agency for Healthcare Research and Quality. Tandem or sequential HSCT may provide survival benefit, and the randomized study showed lower treatment-related mortality with sequential HSCT compared with single HSCT. However, studies have included heterogeneous patient populations, in different salvage treatment settings (ie, first versus subsequent salvage therapy) and have suffered from the lack of a universally accepted prognostic scoring system to risk-stratify patients. Tandem or sequential HSCT has not shown benefit in patients with primary mediastinal germ-cell tumors. Strong clinical support was received from clinical experts in support of the use of tandem or sequential HSCT in the salvage or platinum-refractory setting.

**Practice Guidelines and Position Statements**

**National Comprehensive Cancer Network (NCCN) Guidelines(20)**

NCCN guidelines (v.1.2014) for the treatment of testicular cancer state that if a patient with favorable prognostic factors (defined as testicular primary site, prior complete response to first-line therapy, low levels of serum markers and low-volume disease) has disease recurrence after prior chemotherapy, HDC is an option, or if a patient with disease recurrence undergoes conventional-dose chemotherapy and experiences an incomplete response or relapses, HDC with autologous stem-cell support is category 2A recommendation. Patients with unfavorable prognostic factors (eg, an incomplete response to prior chemotherapy, high levels of serum markers, high-volume disease, extratesticular primary or late relapse) and disease recurrence are considered for treatment with HDC plus autologous stem-cell support (category 2B). The guidelines do not address the use of tandem or sequential HSCT in the treatment of testicular tumors.

**Ongoing and Unpublished Clinical Trials**
A search of the database ClinicalTrials.gov on March 5, 2014, with the term “germ cell” as condition and the term “stem cell” as an intervention identified the following comparative trials evaluating stem-cell transplant for germ cell tumors:

- **Autologous Peripheral Blood Stem Cell Transplant for Germ Cell Tumors (NCT00432094).** This is a nonrandomized phase 2 trial to evaluate the safety/efficacy of a second tandem autologous stem-cell transplant with non-cross-resistant conditioning regimens for patients with germ-cell tumors, compared with 1 autologous stem-cell transplant. Enrollment is planned for 25 subjects; the planned study completion date is June 2015.

- **High-dose Chemotherapy for Poor-prognosis Relapsed Germ-Cell Tumors (NCT00936936).** This is a nonrandomized phase 2 trial to evaluate the safety/efficacy of 2 HDC regimens followed by stem-cell infusion regimens for patients with germ-cell tumor with a first relapse or progression or second response with intermediate or high-risk according to the Beyer model or a second relapse or beyond. Enrollment is planned for 40 subjects; the planned study completion date is June 2015.

No additional comparative trials were identified with a search of the National Cancer Institute’s clinical trials database.

References


Billing Coding/Physician Documentation Information

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<td></td>
<td>autologous</td>
</tr>
<tr>
<td>38208</td>
<td>Transplant preparation of hematopoietic progenitor cells; thawing of previously frozen harvest,</td>
</tr>
<tr>
<td></td>
<td>without washing</td>
</tr>
<tr>
<td>38209</td>
<td>Transplant preparation of hematopoietic progenitor cells; thawing of previously frozen harvest,</td>
</tr>
<tr>
<td></td>
<td>with washing</td>
</tr>
<tr>
<td>38210</td>
<td>Transplant preparation of hematopoietic progenitor cells; specific cell depletion within harvest,</td>
</tr>
<tr>
<td></td>
<td>T-cell depletion</td>
</tr>
<tr>
<td>38211</td>
<td>Transplant preparation of hematopoietic progenitor cells; tumor cell depletion</td>
</tr>
<tr>
<td>38212</td>
<td>Transplant preparation of hematopoietic progenitor cells; red blood cell removal</td>
</tr>
<tr>
<td>38213</td>
<td>Transplant preparation of hematopoietic progenitor cells; platelet depletion</td>
</tr>
<tr>
<td>38214</td>
<td>Transplant preparation of hematopoietic progenitor cells; plasma (volume) depletion</td>
</tr>
<tr>
<td>38215</td>
<td>Transplant preparation of hematopoietic progenitor cells; cell concentration in plasma,</td>
</tr>
<tr>
<td></td>
<td>mononuclear, or buffy coat layer</td>
</tr>
<tr>
<td>38220</td>
<td>Bone marrow; aspiration only</td>
</tr>
<tr>
<td>38221</td>
<td>Bone marrow; biopsy, needle or trocar</td>
</tr>
<tr>
<td>38240</td>
<td>Hematopoietic progenitor cell (HPC); allogeneic transplantation per donor</td>
</tr>
<tr>
<td>38241</td>
<td>Hematopoietic progenitor cell (HPC); autologous transplantation</td>
</tr>
<tr>
<td>38242</td>
<td>Allogeneic lymphocyte infusions</td>
</tr>
<tr>
<td>38243</td>
<td>Hematopoietic progenitor cell (HPC); HPC boost</td>
</tr>
<tr>
<td>86812</td>
<td>HLA typing; A, B, or C, single antigen</td>
</tr>
<tr>
<td>86813</td>
<td>HLA typing; A, B, or C, multiple antigens</td>
</tr>
<tr>
<td>86816</td>
<td>HLA typing; DR/DQ single antigen</td>
</tr>
<tr>
<td>86817</td>
<td>HLA typing; DR/DQ multiple antigens</td>
</tr>
<tr>
<td>86821</td>
<td>HLA typing; lymphocyte culture, mixed (MLC)</td>
</tr>
<tr>
<td>86822</td>
<td>HLA typing; lymphocyte culture, primed (PLC)</td>
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</table>
Chemotherapy administration by other than infusion technique only (e.g., subcutaneous, intramuscular, push), per visit
Chemotherapy administration by infusion technique only, per visit
Chemotherapy administration by both infusion technique and other technique(s) (e.g., subcutaneous, intramuscular, push), per visit
Cord blood harvesting for transplantation, allogeneic
Cord blood-derived stem cell transplantation, allogeneic
Bone marrow or blood-derived peripheral stem cell harvesting and transplantation, allogeneic or autologous, including pheresis, high-dose chemotherapy, and 28 days of post-transplant care (including drugs; hospitalization; medical surgical, diagnosis and emergency services)

Additional Policy Key Words
N/A

Policy Implementation/Update Information
7/1/02 New policy added to the Medical section.
8/1/03 No policy statement changes.
7/1/04 No policy statement changes.
7/1/05 No policy statement changes.
4/1/06 Considerations section revised to include general criteria.
7/1/06 No policy statement changes.
7/1/07 Description and medically necessary policy statement reworded regarding poor-risk germ-cell tumors; however, policy statements are otherwise unchanged.
7/1/08 No policy statement changes.
7/1/09 Terminology in policy statements changed; however, no change in intent of policy statements. “High-dose chemotherapy” removed from title.
7/1/10 Policy statements revised to indicate that tandem-sequential autologous SCT may be considered medically necessary in certain types of testicular cancers.
7/1/11 Minor change to policy statements (deleted statement “Except as noted above for treatment of certain testicular tumors, tandem or sequential autologous hematopoietic stem-cell transplantation is considered investigational to treat germ-cell tumors of any stage.”)
7/1/12 No policy statement changes.
7/1/13 No policy statement changes.
7/1/14 Updated description on CPT 38240, 38241, and added CPT 38242,38243. No policy statement changes.

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