







Consensus in stem cell transplantation for pediatric lymphomas

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ABSTRACT

Lymphomas are the third most common childhood cancer in Brazil. Management is predicated on precise diagnosis and staging through clinical, pathological, molecular, and radiological evaluation. Although the prognosis for pediatric non-Hodgkin and Hodgkin lymphoma has improved markedly, relapsed or refractory cases remain a clinical challenge. For these patients, aggressive chemotherapy followed by autologous or allogeneic hematopoietic cell transplantation serves as a vital salvage strategy. The Pediatric Group of the Brazilian Society of Bone Marrow Transplantation and Cellular Therapy has revised its current consensus, providing updated recommendations for indications and conditioning protocols. This revision also includes the assessment of new therapeutic strategies, including immunotherapy and CAR-T cell therapy, for eligible patients.

Keywords: Pediatrics. Stem Cell Transplantation. Lymphoma.

INTRODUCTION

Lymphomas are the third most common cancer of childhood in Brazil¹. The diagnosis and staging are based on clinical presentation, pathology findings with immunohistochemistry, molecular biology, and radiological imaging. The treatment with multiagent chemotherapy and/or radiotherapy is defined according to the lymphoma subtype, risk stratification, and institutional protocol².

The prognosis of children and adolescents with non-Hodgkin lymphomas (NHL) and Hodgkin's lymphomas (HL) has markedly improved in the last decades. However, relapsed or refractory disease is still associated with an inferior outcome. Aggressive chemotherapy followed by either autologous (auto) or allogeneic hematopoietic cell transplantation (allo-HCT) is a salvage treatment strategy described in the literature, with particularities according to lymphoma subtype and to the available source of stem cells³, as summarized in Table 1.

NON-HODGKIN LYMPHOMA

Pediatric NHL generally has a favorable prognosis with conventional chemotherapy, achieving over 80% survival rates in common subtypes. While prognosis has improved, relapsed or refractory (R/R) disease remains challenging, often requiring aggressive chemotherapy and hematopoietic cell transplantation (HCT)³.

Table 1. Type of transplant.

	Disease Phase	Autologous	Allogenic
Non-Hodgkin lymphomas (BL, DLBL, anaplastic large-cell lymphoma)	First remission	No	No
	Second remission/refractory	Yes	Yes
Lymphoblastic lymphoma	First remission	No	No
	Second remission/refractory	No	Yes
Hodgkin lymphomas	First remission	No	No
	Second remission/refractory	Yes	Yes*

BL DLBL; *it should be used for relapse after auto-hematopoietic cell transplantation or failure to mobilization. Source: Elaborated by the authors.

MATURE B-CELL LYMPHOMAS

Burkitt lymphoma (BL) and diffuse large B-cell lymphoma (DLBCL) are the most common NHL subtypes, with event-free survival rates reaching 90%. The use of rituximab in first-line therapy has significantly improved outcomes in high-risk B-cell NHL by increasing remission rates, reducing R/R disease, and consequently decreasing the need for intensive salvage therapies. In high-risk disease, it should be considered the standard of care^{4,5}.

Prognostic factors for R/R disease include initial treatment intensity (*e.g.*, rituximab use), lactate dehydrogenase levels, early relapse, and bone marrow involvement⁴. DLBCL generally has better survival outcomes than BL⁵. HCT is recommended for chemo-sensitive patients, while those refractory to reinduction ones or first-line therapy derive no survival benefit.

Salvage therapies and transplantation

Salvage regimens include high-risk Berlin-Frankfurt-Münster (BFM) blocks, rituximab, ifosfamide, carboplatin and etoposide (R-ICE), ifosfamide, carboplatin, idarubicin/mitoxantrone, paclitaxel, and rituximab (R-ICI/ICN), and rituximab, vincristine, idarubicin, ifosfamide, carboplatin and dexamethasone (R-VICI), with R-VICI demonstrating the best results⁶. Even in patients who have received rituximab in first-line treatment, reinduction regimens typically include anti-CD20. It is important to remember that remissions are transient, making transplantation an urgent need.

Allo-HCT is a viable alternative to auto-HCT, offering comparable outcomes, especially in cases with mobilization failure or when chemotherapy delays for stem cell collection pose a challenge due to disease progression⁷.

A study by Woessmann et al.⁶ reported that reinduction with intensive continuous chemotherapy using R-VICI before reduced intensity conditioning (RIC) allo-HCT resulted in the highest survival outcomes documented for relapsed/refractory BL, with a four-year overall survival rate of 67%.

There are no prospective randomized trials comparing HCT modalities, but an auto-HCT is preferred for DLBCL, while both approaches can be used for BL ($46 \pm 5\%$ versus $44 \pm 6\%$)⁵.

A tandem transplant strategy has also been explored, in which a myeloablative (MAC) auto-HCT maximizes response, followed by RIC allo-HCT to lower toxicity while maintaining the graft-versus-lymphoma effect⁷.

Emerging therapies: CAR-T and targeted agents

CAR-T cell therapy has emerged as a promising option for pediatric patients with relapsed/refractory DLBCL. While its use is well-established in adults, research in children is still evolving, and ongoing studies will help better define its role and long-term outcomes in the pediatric population. Although experience in pediatric BL is limited, early data suggest that CAR-T therapy could be an alternative for select patients with persistent disease following salvage chemotherapy^{8,9}. However, challenges such as immune escape, relapse, and CAR-T cell persistence remain key areas of investigation.

ANAPLASTIC LARGE-CELL LYMPHOMA

Anaplastic large-cell lymphoma (ALCL) accounts for 10 to 15% of NHL in children, with more than 95% of pediatric patients having anaplastic lymphoma kinase (ALK)-positive disease^{10,11}. Second remission is often consolidated with either high-dose chemotherapy and auto-HCT or allo-HCT, yielding an overall survival rate of 50 to 60%¹².

ALK-positive ALCL is often resistant to conventional chemotherapy. Therefore, salvage therapy is required. In recent years, targeted therapies, such as ALK inhibitors and brentuximab vedotin (BV) have been developed, and they have demonstrated dramatic responses in chemoresistant ALK-positive ALCL¹³⁻¹⁵. HCT may not be necessary for all R/R patients to achieve durable remission, but questions persist about how best to identify patients who may benefit from HCT, the optimal duration of targeted therapy, and the use of combination therapy necessary to achieve a cure¹⁶. In contrast to these intensive therapies, some patients with late relapses have responded to single-agent vinblastine therapy with durable remissions¹⁷.

Knörr et al.¹⁸ have recently reported the results of the ALCL-relapse trial, and auto-HCT was less effective for pediatric patients who experienced early relapse within one year after initial diagnosis when compared to allo-HCT. The five-year event-free survival for CD3-positive ALCL patients was 25% with auto-HCT, compared to 65% with allo-HCT—auto-HCT with BEAM and allo-HCT using TBI or Bu + thiotepa and VP). BFM group reported allo-HCT with MAC (with TBI or busulfan) and ranged event-free survival 75%¹¹.

In cases for whom therapeutic toxicity is a concern, using RIC has the potential to reduce the incidence of treatment-related death, like demonstrated in the Japanese group in a small cohort but with good results, conditioning with low-dose TBI, fludarabine, and melphalan¹⁹.

Lymphoblastic lymphoma

Lymphoblastic lymphoma (LBL) is the second most common type of NHL in childhood and adolescence, accounting for 25–35% of all cases²⁰. With current therapy, the event-free and overall survival for pediatric LBL patients exceeds 80%²¹.

R/R LBL are commonly treated with an ALL-type treatment strategy, allo-HCT with a TBI-based conditioning regimen is recommended. The event-free survival for patients treated with allo-HCT was 40% compared with 4% in the patients who underwent auto-HCT^{5,12,22}.

B-lymphoblastic lymphoma patients were included in the humanized anti-CD19 CAR-T cell trial, with promising anti-tumor efficacy despite the small sample size²³.

The recommended conditioning regimens and salvage treatment strategies for NHL are summarized in Table 2.

Table 2. Suggested strategies according to B-non-Hodgkin lymphoma subtype.

Subtype	Salvage treatment	Conditioning regimen	References
BL	R-ICE or R-VICI	Auto-HCT: Bu 130 mg/m ² /d–D-7 to D-4 (AUC 5,000 μM-min) + Mel 140 mg/m ² /D-2 to D-1;	5,6,24
		Allo-HCT: rituximab 375 mg/m ² D-10 and D-7, Flu 40 mg/m ² D-9 to D-6, paclitaxel 175 mg/m ² (3h) D-9, mitoxantrone 10 mg/m ² (0.5 h) D-9 and D-8, carboplatin 300 mg/m ² (96 h) D-7 to D-4, thiotepa 250 mg/m ² (1h) D-6 to D-4 or TBI-based	
DLBL	R-ICE	BEAM: BCNU 300 mg/m ² (single dose) D-6 + VP 800 mg/m ² (D-5 to D-2) + cytarabine 1,600 mg/m ² twice daily (D-5 to D-2) + Mel 140 mg/m ² (D-1)	5,25
ALCL	Vinblastin-based. BV Crizotinib	TBI 12 Gy D-8 to D-6 + VP 40 mg/kg D-5 + Cy 120 mg/kg D-4 and D-3	26
LBL	ALL protocol	ALL conditioning regimen Total body radiation 1,200 Gy + VP 60 mg/kg D-3	

HCT: hematopoietic cell transplantation; R-ICE: rituximab, ifosfamide, carboplatin and etoposide; R-VICI: rituximab, vincristine, idarubicin, ifosfamide, carboplatin and dexamethasone; BL: Burkitt lymphoma; DLBL: diffuse large cell lymphoma; ALCL: anaplastic large cell lymphoma; LBL: lymphoblastic lymphoma; ALL: acute lymphoblastic leukemia. Source: Elaborated by the authors.

HODGKIN LYMPHOMAS

Due to the high-response rates to conventional treatment, auto-HCT is not indicated as first-line therapy in pediatric HL patients, and it is generally reserved for relapse or primary refractory diseases²⁷. These patients can use a risk stratification to guide rescue treatment plans, as shown in Table 3²⁸.

Table 3. Risk stratification for relapsed and refractory classical Hodgkin lymphoma and proposed treatment.

Risk stratification	Criteria	Proposed treatment
Low risk	<ul style="list-style-type: none"> - Early relapse (< four cycles of first-line chemo); - Late relapse (< six cycles of first-line chemo); - Relapse in stages I–III, without radiotherapy or radiotherapy at a site distinct from the relapse 	<ul style="list-style-type: none"> - Chemotherapy and radiotherapy; - After two cycles, complete response on positron emission tomography–computed tomography; - No response, move to the “Standard” group
Standard	<ul style="list-style-type: none"> - Primarily progressive; - Early relapse (> four cycles of first-line chemotherapy); - Stage IV; - Relapse at a previously irradiated site; - If radiotherapy is considered too toxic. 	<ul style="list-style-type: none"> - Chemotherapy Remission after the first or second line, proceed to auto-HCT. No remission, move to high-risk group
High risk	<ul style="list-style-type: none"> - Patients from the “Standard” group with no response to two lines of salvage therapy 	<ul style="list-style-type: none"> - Therapeutic options to achieve remission before HCT; - Auto-HCT; - Tandem; - Allo-HCT/haplo

HCT: hematopoietic cell transplantation. Source: Daw et al.²⁸.

The goal of rescue chemotherapy is to achieve complete metabolic remission, with pre-auto-HCT positron emission tomography–computed tomography (PET-CT) being a key marker to determine the success of treatment. Even after a partial response, transplantation may still be considered. Special attention must be paid in PET-CT after immune checkpoint inhibitors (anti-PD1) that can present pseudoprogression of HL^{29–31}.

There is no standard salvage regimen for pediatric and adolescent patients with R/R HL. Recent trials have sought to optimize response while trying to minimize additional toxicity before auto-HCT. Regimens such as gemcitabine/vinorelbine/ifosfamide/prednisone (IGEV), GV or IV with or without bortezomib demonstrated comparable responses to the more toxic regimens, such as ICE, and are preferred among pediatric oncologists^{28,32}. Conjugated antibody therapy, BV, or immunotherapy with anti-PD1, nivolumab or pembrolizumab can be used as rescue treatment for refractory or relapsed patients after second-line therapy^{33–35}. Subsequent studies have sought to combine BV with traditional cytotoxic chemotherapy, like bendamustine (Benda) or gemcitabine (Gem), to improve responses^{32,36}. PD-1 blockade may augment chemosensitivity in patients with R/R HL, and auto-HCT was associated with excellent outcomes, even among heavily pretreated, previously chemorefractory patients³⁷.

High-dose chemotherapy and autologous hematopoietic cell transplantation

There is no standard conditioning in the pediatric HL. The optimal conditioning regimen should be based on clinical status, known efficacy of previous drugs utilized, tumor localization, financial cost, and regulatory approval by local authorities. The most used conditioning regimens are the BEAM regimen or the alternative LEAM, which appears to have equivalent toxicity and efficacy. Benda, a very active drug in HL, may also be used in a conditioning regimen. Studies comparing BEAM and benda-EAM (with bendamustine replacing BCNU) have shown similar four-year progression free-survival (PFS) and overall survival²⁸. Nieto et al.^{38–40} present gemcitabine/busulfan/melphalan as a feasible regimen with substantial activity against a range of lymphoid malignancies with improved outcomes. The consensus suggestion is shown in Table 4.

Maintenance therapy after auto-hematopoietic cell transplantation

BV therapy as consolidation after auto-HCT can offer benefits for patients with R/R HL and higher risk of relapse (primary refractory disease, early relapse < 12 months after initial therapy, partial response to rescue therapy,

Table 4. Conditioning regimens for autologous transplant Hodgkin lymphoma.

Name	Description	References
BEAM	- BCNU 300 mg/m ² (single dose) D-6 + VP 800 mg/m ² (D-5 to D-2) + cytarabine 1,600 mg/m ² twice daily (D-5 to D-2) + Mel 140 mg/m ² (D-1)	56,57
BU/Mel/Gem - High risk	- Gem 2,000 mg/m ² D-8 + Bu 16 mg/kg D-8 to D-5 + Mel 140 mg/m ² D-3 to D-2	38
Bu/Mel - Standard risk	9	
Other options		
LEAM Benda-EAM	Using CCNU 200 mg/m ² D-6 or Benda 200 mg/m ² D-7 to D-6 (in the place of BCNU); - VP 800 mg/m ² (D-5 to D-2) + cytarabine 1,600 mg/m ² twice daily (D-5 to D-2) + Mel 140 mg/m ² (D-1)	57,58
BuCy	- Bu (dose according to body weight* or adjustment based on pharmacokinetic studies, if available): D-8 to D-5 + Cy 120 mg/kg (D-4 and D-3) w/wo VP 45–60 mg/kg D-5	59–61

*Intravenous daily dose = < 9 kg: 4 mg/kg; 9 to < 16 kg: 4.8 mg/kg; 16–23 kg: 4.4 mg/kg; > 23 to 34 kg: 3.8 mg/kg; > 34 kg: 3.2 mg/kg; carmustine; CCNU: lomustine; VP: etoposide. Source: Elaborated by the authors.

B symptoms or extranodal disease at relapse, and two or more rescue therapies prior to transplantation). The use of 16 cycles of BV (1.8 mg/kg every three weeks) after auto-HCT has shown to improve PFS, although with limited impact on overall survival. Studies have not proven the benefit of other maintenance regimens yet^{41–44}.

Radiotherapy

The role of radiotherapy in the treatment of R/R HL in combination with HCT is not fully established yet. However, it remains a viable therapeutic option, especially considering that many pediatric patients with relapsed HL did not receive irradiation as part of their first-line treatment. Some studies suggest that post-transplant local radiotherapy may improve PFS, though with no significant impact on overall survival. Patients with limited-stage relapses, bulky disease, B symptoms, refractory disease, or partial response to pre-transplant treatment could be candidates for post-transplant local irradiation. Patients who do not achieve complete remission after transplantation may also benefit from local radiotherapy²⁸.

Allogenic hematopoietic cell transplantation

TANDEM transplantation is an alternative for patients considered at high risk for relapses after auto-HCT. This approach consists of a MAC auto-HCT followed by a non-myeloablative conditioning allo-HCT, which could be a safety and efficacy strategy for refractory patients, using matched or haplo-donors^{45,46}.

Allo-HCT can be considered for relapses post-auto-HCT, failure to harvest stem cells from the bone marrow or the peripheral blood or after several relapses. The conditioning regimens are either MAC or RIC, with an expected graft *versus* lymphoma effect to reduce the risk of relapse. The overall survival is comparable in both approaches, with relapses more like after a RIC transplant, whereas toxicity is more common following MAC strategy. The choice between RIC and MAC should consider the patient's individual treatment strategy, clinical status, number of previous treatments, and the perspective of adjuvant therapy⁴⁷. With modern transplant practices, the non-relapse mortality (NRM) associated with MAC for HL has strongly decreased, resulting in non-significant improvement of event-free survival, because of a somewhat better disease control compared with RIC transplants⁴⁸. Conditioning regimens are in Table 5 and GVHD prophylaxis in Table 6.

The use of T-cell-replete haploidentical HCT (haplo-HCT) with post-infusion cyclophosphamide (PTCy) in advanced hematological malignancies showed a good toxicity profile. It appears that haplo-HCT acts effectively against HL cells (immunological effect) and it is a good choice in the treatment of poor prognosis HL without a HLA donor⁴⁹. Comparative studies demonstrated that allo-HCT from full-matched and haplo-donors have similar outcomes, with a reduced relapse rate and better overall survival with PTCy haplo-HCT^{50–52}.

Table 5. Conditioning regimens for allogeneic transplant Hodgkin lymphoma.

Donor	Conditioning regimens	References
Matched donor	RIC: Flu 150 mg/m ² D-8 to D-4 + Mel 140 mg/m ² D-3 to D-2	47,48,62
	BEAM or LEAM (w/wo intravenous alemtuzumab 10 mg D-5 to D-1)	63
	MAC: Bu (dose according to body weight* or adjustment based on pharmacokinetic studies, if available) (D-8 to D-5) + Cy 120 mg/kg (D-4 and D-3) w/wo VP 30 mg/kg D-5	60,61
Haplo	Cy 29 mg/kg D-6 and D-5 + Flu 150 mg/m ² D-6 to D-2 + TBI (2 Gy) on D-1	50

*Intravenous daily dose = < 9 kg: 4 mg/kg; 9 to < 16 kg: 4.8 mg/kg; 16–23 kg: 4.4 mg/kg; > 23 to 34 kg: 3.8 mg/kg; > 34 kg: 3.2 mg/kg; RIC: reduced intensity conditioning; MAC: myeloablative; VP: etoposide; TBI: total body irradiation. Source: Elaborated by the authors.

Table 6. Graft-versus-host disease prophylaxis.^{50,60-63}

Donor	Immunosuppression
Matched	CYS D-2 to D+180 (tapering from D+90) + MTX 10 mg/m ² D+1, +3, +6 (+–D+11) (ATG 5 mg/kg D-4 to D-2 if MUD)
Haplo	CYS D-2 to D+180 (tapering from D+90) + MTX 10 mg/m ² D+1, +3, +6 (+–D+11) (ATG 5 mg/kg D-4 to D-2 if MUD)

CYS: cyclosporine; MTX: methotrexate; ATG: rabbit antithymocytic globulin; MUD: matched unrelated donor. Source: Elaborated by the authors.

Allo-HCT after PD-1 blockade may be associated with increased toxicity and risk for developing severe acute graft-versus-host disease (GVHD), and it needs a minimal six-week interval between them. The use of PTCy-based GVHD prophylaxis was associated with significant improvements in PFS and GVHD-free relapse-free survival in this condition⁵³.

CAR-T cell

CAR-T cell therapy is a promising approach in oncology hematology. Patients with refractory HL treated with autologous T cells carrying a chimeric antigen receptor targeted against CD30, combined with lymphodepleting conditioning regimens, have achieved good response rates. However, these results are still preliminary, given the short follow-up time^{54,55}.

CONFLICT OF INTEREST

Nothing to declare.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable.

AUTHORS' CONTRIBUTIONS

Substantive scientific and intellectual contributions to the study: Kuwahara C, Breviglieri CNM, Milaré L and Menezes Neto OA. **Conception and design:** Kuwahara C, Breviglieri CNM, Milaré L and Menezes Neto OA. **Analysis and interpretation of data:** Kuwahara C, Breviglieri CNM, Milaré L and Menezes Neto OA. **Technical procedures:** Kuwahara C, Breviglieri CNM, Milaré L and Menezes Neto OA. **Manuscript writing:** Kuwahara C, Breviglieri CNM, Milaré L and Menezes Neto OA. **Final approval:** Kuwahara C.

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DECLARATION OF USE OF ARTIFICIAL INTELLIGENCE TOOLS

We did not use artificial intelligence tools.

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REFERENCES

1. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação de Prevenção e Vigilância. Incidência, mortalidade e morbidade hospitalar por câncer em crianças, adolescentes e adultos jovens no Brasil: informações dos registros de câncer e do sistema de mortalidade. Rio de Janeiro: Instituto Nacional de Câncer José Alencar Gomes da Silva; 2016.
2. PDQ Pediatric Treatment Editorial Board. Childhood Hodgkin lymphoma treatment (PDQ®): health professional version. PDQ cancer information summaries. Bethesda: National Cancer Institute; 2002–2021.
3. Kuwahara CC, Zamperlini Neto G, Michalowski MB, Ginani VC, Breviglieri CNM. Hematopoietic stem cell transplantation for pediatric lymphomas. *J Bone Marrow Transplant Cell*. 2021;2(4):135. <https://doi.org/10.46765/2675-374X.2021v2n4p135>
4. Cairo M, Auperin A, Perkins SL, Pinkerton R, Harrison L, Goldman S, Patte C. Overall survival of children and adolescents with mature B cell non-Hodgkin lymphoma who had refractory or relapsed disease during or after treatment with FAB/LMB 96: A report from the FAB/LMB 96 study group. *Br J Haematol*. 2018;182(6):859–69. <https://doi.org/10.1111/bjh.15491>
5. Burkhardt B, Taj M, Garnier N, Minard-Colin V, Hazar V, Mellgren K, Osumi T, Fedorova A, Myakova N, Verdu-Amoros J, Andres M, Kabickova E, Attarbaschi A, Chiang AKS, Bubanska E, Donska S, Hjalgrim LL, Wachowiak J, Pieczonka A, Uyttebroeck A, Lazic J, Loeffen J, Buechner J, Niggli F, Csoka M, Krivan G, Palma J, Burke GAA, Beishuizen A, Koepfen K, Mueller S, Herbrueggen H, Woessmann W, Zimmermann M, Balduzzi A, Pillon M. Treatment and outcome analysis of 639 relapsed non-Hodgkin lymphomas in children and adolescents and resulting treatment recommendations. *Cancers*. 2021;13(9):2075. <https://doi.org/10.3390/cancers13092075>
6. Woessmann W, Zimmermann M, Meinhardt A, Müller S, Hauch H, Knörr F, Oschlies I, Klapper W, Niggli F, Kabickova E, Attarbaschi A, Reiter A, Burkhardt B. Progressive or relapsed Burkitt lymphoma or leukemia in children and adolescents after BFM-type first-line therapy. *Blood*. 2020;135(14):1124–32. <https://doi.org/10.1182/blood.2019003591>
7. Moleti ML, Testi AM, Foà R. Treatment of relapsed/refractory paediatric aggressive B-cell non-Hodgkin lymphoma. *Br J Haematol*. 2020;189(5):826–43. <https://doi.org/10.1111/bjh.16461>
8. Rivers J, Annesley C, Summers C, Finney O, Pulsipher MA, Wayne AS, Park JR, Jensen MC, Gardner R. Early response data for pediatric patients with non-Hodgkin lymphoma treated with CD19 chimeric antigen receptor (CAR) T-cells. *Blood*. 2018;132(Suppl.1):2957. <https://doi.org/10.1182/blood-2018-99-113744>
9. Zhang WQ, Hu B, Jin L, Yang J, Du J, Wang S, Ren YL, Liu Y, Zhang YH. Chimeric antigen receptor t-cells (car-t) for refractory and relapsed burkitt's lymphoma: early response in pediatric patients. *Hematol Oncol*. 2018;59–60. https://doi.org/10.1002/hon.28_2629
10. Lowe EJ, Gross TG. Anaplastic large cell lymphoma in children and adolescents. *Pediatr Hematol Oncol*. 2013 Sep;30(6):509–19.
11. Woessmann W, Zimmermann M, Lenhard M, Burkhardt B, Rossig C, Kremens B, Lang P, Attarbaschi A, Mann G, Oschlies I, Klapper W, Reiter A. Relapsed or refractory anaplastic large-cell lymphoma in children and adolescents after Berlin-Frankfurt-Muenster (BFM)-type first-line therapy: a BFM-group study. *J Clin Oncol Off J Am Soc Clin Oncol*. 2011;29(22):3065–71. <https://doi.org/10.1200/jco.2011.34.8417>

12. Gross TG, Hale GA, He W, Camitta BM, Sanders JE, Cairo MS, Hayashi RJ, Termuhlen AM, Zhang MJ, Davies SM, Eapen M. Hematopoietic stem cell transplantation for refractory or recurrent non-Hodgkin lymphoma in children and adolescents. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant*. 2010;16(2):223–30. <https://doi.org/10.1016/j.bbmt.2009.09.021>
13. Locatelli F, Mauz-Koerholz C, Neville K, Llorca A, Beishuizen A, Daw S, Pillon M, Aladjidi N, Klingebiel T, Landman-Parker J, Medina-Sanson A, August K, Sachs J, Hoffman K, Kinley J, Song S, Song G, Zhang S, Suri A, Gore L. Brentuximab vedotin for paediatric relapsed or refractory Hodgkin's lymphoma and anaplastic large-cell lymphoma: a multicentre, open-label, phase 1/2 study. *Lancet Haematol*. 2018;5(10):e450–61. [https://doi.org/10.1016/s2352-3026\(18\)30153-4](https://doi.org/10.1016/s2352-3026(18)30153-4)
14. Pro B, Advani R, Brice P, Bartlett NL, Rosenblatt JD, Illidge T, Matous J, Ramchandren R, Fanale M, Connors JM, Yang Y, Sievers EL, Kennedy DA, Shustov A. Brentuximab vedotin (SGN-35) in patients with relapsed or refractory systemic anaplastic large-cell lymphoma: results of a phase II study. *J Clin Oncol Off J Am Soc Clin Oncol*. 2012;30(18):2190–6. <https://doi.org/10.1200/jco.2011.38.0402>
15. Pro B, Advani R, Brice P, Bartlett NL, Rosenblatt JD, Illidge T, Matous J, Ramchandren R, Fanale M, Connors JM, Fenton K, Huebner D, Pinelli JM, Kennedy DA, Shustov A. Five-year results of brentuximab vedotin in patients with relapsed or refractory systemic anaplastic large cell lymphoma. *Blood*. 2017;130(25):2709–17. <https://doi.org/10.1182/blood-2017-05-780049>
16. Marks LJ, Ritter V, Agrusa JE, Kamdar KY, Rivers J, Gardner R, Ehrhardt MJ, Devine KJ, Phillips CA, Reilly A, August K, Weinstein J, Satwani P, Forlenza CJ, Smith CM, Greer C, Afify Z, Lin CH, Belsky JA, Ding H, Hoogstra D, Toner K, Link MP, Schultz LM, Lowe EJ, Aftandilian C. Pediatric relapsed/refractory ALK-positive anaplastic large cell lymphoma treatment and outcomes in the targeted-drug era. *Blood Adv*. 2025;9(6):1356–65. <https://doi.org/10.1182/bloodadvances.2024014745>
17. Brugières L, Pacquement H, Le Deley MC, Leverger G, Lutz P, Paillard C, Baruchel A, Frappaz D, Nelken B, Lamant L, Patte C. Single-drug vinblastine as salvage treatment for refractory or relapsed anaplastic large-cell lymphoma: a report from the French Society of Pediatric Oncology. *J Clin Oncol Off J Am Soc Clin Oncol*. 2009;27(30):5056–61. <https://doi.org/10.1200/jco.2008.20.1764>
18. Knörr F, Brugières L, Pillon M, Zimmermann M, Ruf S, Attarbaschi A, Mellgren K, Burke GAA, Uyttebroeck A, Wróbel G, Beishuizen A, Aladjidi N, Reiter A, Woessmann W; European Inter-Group for Childhood Non-Hodgkin Lymphoma. Stem cell transplantation and vinblastine monotherapy for relapsed pediatric anaplastic large cell lymphoma: results of the international, prospective ALCL-relapse trial. *J Clin Oncol Off J Am Soc Clin Oncol*. 2020;38(34):3999–4009. <https://doi.org/10.1200/jco.20.00157>
19. Kada A, Fukano R, Mori T, Kamei M, Tanaka F, Ueyama J, Sekimizu M, Osumi T, Mori T, Koga Y, Ohki K, Fujita N, Mitsui T, Saito AM, Hashimoto H, Kobayashi R. A multicenter, open-label, clinical trial to assess the effectiveness and safety of allogeneic hematopoietic stem cell transplantation using reduced-intensity conditioning in relapsed/refractory anaplastic large-cell lymphoma in children. *Acta Med Okayama*. 2020;74(1):89–94. <https://doi.org/10.18926/amo/57959>
20. Burkhardt B, Zimmermann M, Oschlies I, Niggli F, Mann G, Parwaresch R, Riehm H, Schrappe M, Reiter A; BFM Group. The impact of age and gender on biology, clinical features and treatment outcome of non-Hodgkin lymphoma in childhood and adolescence. *Br J Haematol*. 2005;131(1):39–49. <https://doi.org/10.1111/j.1365-2141.2005.05735.x>
21. Si Lim SJ, Ford JB, Hermiston ML. How I treat newly diagnosed and refractory T-cell acute lymphoblastic lymphoma in children and young adults. *Blood*. 2023;141(25):3019–30. <https://doi.org/10.1182/blood.2022016503>

22. Morita-Fujita M, Arai Y, Yoshioka S, Ishikawa T, Kanda J, Kondo T, Akasaka T, Ueda Y, Imada K, Moriguchi T, Yago K, Kitano T, Yonezawa A, Nohgawa M, Takaori-Kondo A; Kyoto Stem Cell Transplantation Group (KSCTG). Indication and benefit of upfront hematopoietic stem cell transplantation for T-cell lymphoblastic lymphoma in the era of ALL-type induction therapies. *Sci Rep*. 2020;10(1):21418. <https://doi.org/10.1038/s41598-020-78334-x>
23. Myers RM, Li Y, Barz Leahy A, Barrett DM, Teachey DT, Callahan C, Fasano CC, Rheingold SR, DiNofia A, Wray L, Aplenc R, Baniewicz D, Liu H, Shaw PA, Pequignot E, Getz KD, Brogdon JL, Fesnak AD, Siegel DL, Davis MM, Bartoszek C, Lacey SF, Hexner EO, Chew A, Wertheim GB, Levine BL, June CH, Grupp SA, Maude SL. Humanized CD19-targeted chimeric antigen receptor (CAR) T cells in CAR-naive and CAR-exposed children and young adults with relapsed or refractory acute lymphoblastic leukemia. *J Clin Oncol Off J Am Soc Clin Oncol*. 2021;39(27):3044–55. <https://doi.org/10.1200/jco.20.03458>
24. Kebriaei P, Madden T, Kazerooni R, Wang X, Thall PF, Ledesma C, Nieto Y, Shpall EJ, Hosing C, Qazilbash M, Popat U, Khouri I, Champlin RE, Jones RB, Andersson BS. Intravenous busulfan plus melphalan is a highly effective, well-tolerated preparative regimen for autologous stem cell transplantation in patients with advanced lymphoid malignancies. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant*. 2011;17(3):412–20. <https://doi.org/10.1016/j.bbmt.2010.07.016>
25. Sureda A, Mataix R, Hernández-Navarro F, Jarque I, Lahuerta JJ, Tomás JF, Brunet S, Caballero D, Conde E, León A, Fernández MN, López A, Maldonado J, Bengoechea E, Callís M, Carrera D, García-Conde J, García-Laraña J, Moraleda JM, Morey M, Rifón J, Sierra J, Torres A, Domingo-Albós A. Autologous stem cell transplantation for poor prognosis Hodgkin's disease in first complete remission: a retrospective study from the Spanish GEL-TAMO cooperative group. *Bone Marrow Transplant*. 1997;20(4):283–8. <https://doi.org/10.1038/sj.bmt.1700886>
26. Woessmann W, Peters C, Lenhard M, Burkhardt B, Sykora KW, Dilloo D, Kremens B, Lang P, Führer M, Kühne T, Parwaresch R, Ebell W, Reiter A. Allogeneic haematopoietic stem cell transplantation in relapsed or refractory anaplastic large cell lymphoma of children and adolescents--a Berlin-Frankfurt-Münster group report. *Br J Haematol*. 2006;133(2):176–82. <https://doi.org/10.1111/j.1365-2141.2006.06004.x>
27. Perales MA, Ahmed S. When to use stem cell transplantation for classical Hodgkin lymphoma. *Hematol Am Soc Hematol Educ Program*. 2024;2024(1):517–23. <https://doi.org/10.1182/hematology.2024000575>
28. Daw S, Hasenclever D, Mascarín M, Fernández-Teijeiro A, Balwierz W, Beishuizen A, Burnelli R, Cepelova M, Claviez A, Dieckmann K, Landman-Parker J, Kluge R, Körholz D, Mauz-Körholz C, Wallace WH, Leblanc T. Risk and response adapted treatment guidelines for managing first relapsed and refractory classical Hodgkin lymphoma in children and young people. Recommendations from the EuroNet Pediatric Hodgkin Lymphoma Group. *HemaSphere*. 2020;4(1):e329. <https://doi.org/10.1097/hs9.0000000000000329>
29. Shah GL, Yahalom J, Matasar MJ, Verwys SL, Goldman DA, Bantilan KS, Zhang Z, McCall SJ, Moskowitz AJ, Moskowitz CH. Risk factors predicting outcomes for primary refractory Hodgkin lymphoma patients treated with salvage chemotherapy and autologous stem cell transplantation. *Br J Haematol*. 2016;175(3):440–7. <https://doi.org/10.1111/bjh.14245>
30. Adams HJA, Nievelstein RAJ, Kwee TC. Systematic review and meta-analysis on the prognostic value of complete remission status at FDG-PET in Hodgkin lymphoma after completion of first-line therapy. *Ann Hematol*. 2016;95(1):1–9. <https://doi.org/10.1007/s00277-015-2529-2>
31. Perales MA, Ceberio I, Armand P, Burns LJ, Chen R, Cole PD, Evens AM, Laport GG, Moskowitz CH, Popat U, Reddy NM, Shea TC, Vose JM, Schriber J, Savani BN, Carpenter PA; American Society for Blood and Marrow Transplantation. Role of cytotoxic therapy with hematopoietic cell transplantation in the treatment of Hodgkin lymphoma: Guidelines from the American Society for Blood and Marrow Transplantation. *Biol Blood Marrow Transplant*. 2015;21(6):971–83. <https://doi.org/10.1016/j.bbmt.2015.02.022>

32. Forlenza CJ, Gulati N, Mauguen A, Absalon MJ, Castellino SM, Franklin A, Keller FG, Shukla N. Combination brentuximab vedotin and bendamustine for pediatric patients with relapsed/refractory Hodgkin lymphoma. *Blood Adv.* 2021;5(24):5519–24. <https://doi.org/10.1182/bloodadvances.2021005268>
33. Castagna L, Santoro A, Carlo-Stella C. Salvage therapy for Hodgkin's lymphoma: a review of current regimens and outcomes. *J Blood Med.* 2020;11:389-403. <https://doi.org/10.2147/JBM.S250581>
34. Moskowitz AJ, Schöder H, Yahalom J, McCall SJ, Fox SY, Gerecitano J, Grewal R, Hamlin PA, Horwitz S, Kobos R, Kumar A, Matasar M, Noy A, Palomba ML, Perales MA, Portlock CS, Sauter C, Shukla N, Steinherz P, Straus D, Trippett T, Younes A, Zelenetz A, Moskowitz CH. PET-adapted sequential salvage therapy with brentuximab vedotin followed by augmented ifosamide, carboplatin, and etoposide for patients with relapsed and refractory Hodgkin's lymphoma: a non-randomised, open-label, single-centre, phase 2 study. *Lancet Oncol.* 2015;16(3):284–92. [https://doi.org/10.1016/s1470-2045\(15\)70013-6](https://doi.org/10.1016/s1470-2045(15)70013-6)
35. Georger B, Kang HJ, Yalon-Oren M, Marshall LV, Vezina C, Pappo A, Laetsch TW, Petrilli AS, Ebinger M, Toporski J, Glade-Bender J, Nicholls W, Fox E, DuBois SG, Macy ME, Cohn SL, Pathiraja K, Diede SJ, Ebbinghaus S, Pinto N. Pembrolizumab in paediatric patients with advanced melanoma or a PD-L1-positive, advanced, relapsed, or refractory solid tumour or lymphoma (KEYNOTE-051): interim analysis of an open-label, single-arm, phase 1-2 trial. *Lancet Oncol.* 2020;21(1):121–33. [https://doi.org/10.1016/s1470-2045\(19\)30671-0](https://doi.org/10.1016/s1470-2045(19)30671-0)
36. Cole PD, McCarten KM, Pei Q, Spira M, Metzger ML, Drachtman RA, Horton TM, Bush R, Blaney SM, Weigel BJ, Kelly KM. Brentuximab vedotin with gemcitabine for paediatric and young adult patients with relapsed or refractory Hodgkin's lymphoma (AHOD1221): a Children's Oncology Group, multicentre single-arm, phase 1-2 trial. *Lancet Oncol.* 2018;19(9):1229–38. [https://doi.org/10.1016/s1470-2045\(18\)30426-1](https://doi.org/10.1016/s1470-2045(18)30426-1)
37. Merryman RW, Redd RA, Nishihori T, Chavez J, Nieto Y, Darrah JM, Rao U, Byrne MT, Bond DA, Maddocks KJ, Spinner MA, Advani RH, Ballard HJ, Svoboda J, Singh AK, McGuirk JP, Modi D, Ramchandren R, Romancik J, Cohen JB, Frigault MJ, Chen YB, Serritella AV, Kline J, Ansell S, Nathan S, Rahimian M, Joyce RM, Shah M, David KA, Park S, Beaven AW, Habib A, Bachanova V, Nakhoda S, Khan N, Lynch RC, Smith SD, Ho VT, LaCasce A, Armand P, Herrera AF. Autologous stem cell transplantation after anti-PD-1 therapy for multiply relapsed or refractory Hodgkin lymphoma. *Blood Adv.* 2021;5(6):1648–59. <https://doi.org/10.1182/bloodadvances.2020003556>
38. Nieto Y, Thall PF, Ma J, Valdez BC, Ahmed S, Anderlini P, Popat U, Jones RB, Shpall EJ, Hosing C, Qazilbash M, Kebriaei P, Alousi A, Timmons M, Gulbis A, Myers A, Oki Y, Fanale M, Dabaja B, Pinnix C, Milgrom S, Champlin R, Andersson BS. Phase II trial of high-dose Gemcitabine/Busulfan/Melpahlan with autologous stem-cell transplantation for primary refractory or poor-risk relapsed Hodgkin's Lymphoma. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant.* 2018;24(8):1602–9. <https://doi.org/10.1016/j.bbmt.2018.02.020>
39. Nieto Y, Gruschkus S, Valdez BC, Jones RB, Anderlini P, Hosing C, Popat U, Qazilbash M, Kebriaei P, Alousi A, Saini N, Srouf S, Rezvani K, Ramdial J, Barnett M, Gulbis A, Shigle TL, Ahmed S, Iyer S, Lee H, Nair R, Parmar S, Steiner R, Dabaja B, Pinnix C, Gunther J, Cuglievan B, Mahadeo K, Khazal S, Chuang H, Champlin R, Shpall EJ, Andersson BS. Improved outcomes of high-risk relapsed Hodgkin lymphoma patients after high-dose chemotherapy: a 15-year analysis. *Haematologica.* 2021;107(4):899–908. <https://doi.org/10.3324/haematol.2021.278311>
40. Nieto Y, Popat U, Anderlini P, Valdez B, Andersson B, Liu P, Hosing C, Shpall EJ, Alousi A, Kebriaei P, Qazilbash M, Parmar S, Bashir Q, Shah N, Khouri I, Rondon G, Champlin R, Jones RB. Autologous stem cell transplantation for refractory or poor-risk relapsed Hodgkin's lymphoma: effect of the specific high-dose chemotherapy regimen on outcome. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant.* 2013;19(3):410–7. <https://doi.org/10.1016/j.bbmt.2012.10.029>

41. Moskowitz CH, Nademanee A, Masszi T, Agura E, Holowiecki J, Abidi MH, Chen AI, Stiff P, Gianni AM, Carella A, Osmanov D, Bachanova V, Sweetenham J, Sureda A, Huebner D, Sievers EL, Chi A, Larsen EK, Hunder NN, Walewski J; AETHERA Study Group. Brentuximab vedotin as consolidation therapy after autologous stem-cell transplantation in patients with Hodgkin's lymphoma at risk of relapse or progression (AETHERA): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Lond Engl*. 2015;385(9980):1853–62. [https://doi.org/10.1016/s0140-6736\(15\)60165-9](https://doi.org/10.1016/s0140-6736(15)60165-9)
42. Moskowitz CH, Walewski J, Nademanee A, Masszi T, Agura E, Holowiecki J, Abidi MH, Chen AI, Stiff P, Viviani S, Bachanova V, Sureda A, McClendon T, Lee C, Lisano J, Sweetenham J. Five-year PFS from the AETHERA trial of brentuximab vedotin for Hodgkin lymphoma at high risk of progression or relapse. *Blood*. 2018;132(25):2639–42. <https://doi.org/10.1182/blood-2018-07-861641>
43. Sureda A, André M, Borchmann P, da Silva MG, Gisselbrecht C, Vassilakopoulos TP, Zinzani PL, Walewski J. Improving outcomes after autologous transplantation in relapsed/refractory Hodgkin lymphoma: a European expert perspective. *BMC Cancer*. 2020;20(1):1088. <https://doi.org/10.1186/s12885-020-07561-2>
44. Armand P, Chen YB, Redd RA, Joyce RM, Bsat J, Jeter E, Merryman RW, Coleman KC, Dahi PB, Nieto Y, LaCasce AS, Fisher DC, Ng SY, Odejide OO, Freedman AS, Kim AI, Crombie JL, Jacobson CA, Jacobsen ED, Wong JL, Patel SS, Ritz J, Rodig SJ, Shipp MA, Herrera AF. PD-1 blockade with pembrolizumab for classical Hodgkin lymphoma after autologous stem cell transplantation. *Blood*. 2019;134(1):22–9. <https://doi.org/10.1182/blood.2019000215>
45. Satwani P, Jin Z, Martin PL, Bhatia M, Garvin JH, George D, Chaudhury S, Talano J, Morris E, Harrison L, Sosna J, Peterson M, Militano O, Foley S, Kurtzberg J, Cairo MS. Sequential myeloablative autologous stem cell transplantation and reduced intensity allogeneic hematopoietic cell transplantation is safe and feasible in children, adolescents and young adults with poor-risk refractory or recurrent Hodgkin and non-Hodgkin lymphoma. *Leukemia*. 2015;29(2):448–55. <https://doi.org/10.1038/leu.2014.194>
46. Mariotti J, Bramanti S, Devillier R, Furst S, El Cheikh J, Sarina B, Granata A, Faucher C, Harbi S, Morabito L, Weiller PJ, Chabannon C, Mokart J, Mineri R, Carlo-Stella C, Santoro A, Blaise D, Castagna L. Tandem autologous-haploidentical transplantation is a feasible and effective program for refractory Hodgkin lymphoma. *Bone Marrow Transplant*. 2018;53(3):366–70. <https://doi.org/10.1038/s41409-017-0032-1>
47. Claviez A, Canals C, Dierickx D, Stein J, Badell I, Pession A, Mackinnon S, Slavin S, Dalle JH, Chacón MJ, Sarhan M, Wynn RF, Suttrop M, Dini G, Sureda A, Schmitz N; Lymphoma and Pediatric Diseases Working Parties. Allogeneic hematopoietic stem cell transplantation in children and adolescents with recurrent and refractory Hodgkin lymphoma: an analysis of the European Group for Blood and Marrow Transplantation. *Blood*. 2009;114(10):2060–7. <https://doi.org/10.1182/blood-2008-11-189399>
48. Genadieva-Stavrik S, Boumendil A, Dreger P, Peggs K, Briones J, Corradini P, Bacigalupo A, Socié G, Bonifazi F, Finel H, Velardi A, Potter M, Bruno B, Castagna L, Malladi R, Russell N, Sureda A. Myeloablative versus reduced intensity allogeneic stem cell transplantation for relapsed/refractory Hodgkin's lymphoma in recent years: a retrospective analysis of the Lymphoma Working Party of the European Group for Blood and Marrow Transplantation. *Ann Oncol*. 2016;27(12):2251–7. <https://doi.org/10.1093/annonc/mdw421>
49. Castagna L, Bramanti S, Devillier R, Sarina B, Crocchiolo R, Furst S, El-Cheikh J, Granata A, Faucher C, Harbi S, Morabito L, Mariotti J, Puvinathan S, Weiller PJ, Chabannon C, Mokart D, Carlo-Stella C, Bouabdallah R, Santoro A, Blaise D. Erratum: Haploidentical transplantation with post-infusion cyclophosphamide in advanced Hodgkin lymphoma. *Bone Marrow Transplant*. 2017;52(5):797. <https://doi.org/10.1038/bmt.2017.26>
50. Castagna L, Busca A, Bramanti S, Raiola Anna M, Malagola M, Ciceri F, Arcese W, Vallisa D, Patriarca F, Specchia G, Raimondi R, Devillier R, Furst S, Giordano L, Sarina B, Mariotti J, Olivieri A, Bouabdallah R, Carlo-Stella C, Rambaldi A, Santoro A, Corradini P, Bacigalupo A, Bonifazi F, Blaise D. Haploidentical related donor compared to HLA-identical donor transplantation for chemosensitive Hodgkin lymphoma patients. *BMC Cancer*. 2020;20(1):1140. <https://doi.org/10.1186/s12885-020-07602-w>

51. Mariotti J, Devillier R, Bramanti S, Sarina B, Furst S, Granata A, Faucher C, Harbi S, Morabito L, Chabannon C, Carlo-Stella C, Bouabdallah R, Santoro A, Blaise D, Castagna L. T Cell-replete haploidentical transplantation with post-transplantation cyclophosphamide for Hodgkin lymphoma relapsed after autologous transplantation: reduced incidence of relapse and of chronic graft-versus-host disease compared with HLA-identical related donors. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant*. 2018;24(3):627–32. <https://doi.org/10.1016/j.bbmt.2017.11.030>
52. Gauthier J, Castagna L, Garnier F, Guillaume T, Socié G, Maury S, Maillard N, Tabrizi R, Marchand T, Malfuson J, Gac A, Gyan E, Mercier M, Béguin Y, Delage J, Turlure P, Marçais A, Nguyen S, Dulery R, Bay J, Huynh A, Daguindau E, Cornillon J, Régnier C, Michallet M, Peffault de Latour R, Yakoub-Agha I, Blaise D. Reduced-intensity and non-myeloablative allogeneic stem cell transplantation from alternative HLA-mismatched donors for Hodgkin lymphoma: a study by the French Society of Bone Marrow Transplantation and Cellular Therapy. *Bone Marrow Transplant*. 2017;52(5):689–96. <https://doi.org/10.1038/bmt.2016.349>
53. Merryman RW, Castagna L, Giordano L, Ho VT, Corradini P, Guidetti A, Casadei B, Bond DA, Jaglowski S, Spinner MA, Arai S, Lowsky R, Shah GL, Perales MA, De Colella JMS, Blaise D, Herrera AF, Shouse G, Spilleboudt C, Ansell SM, Nieto Y, Badar T, Hamadani M, Feldman TA, Dahncke L, Singh AK, McGuirk JP, Nishihori T, Chavez J, Serritella AV, Kline J, Mohty M, Dulery R, Stamatoulas A, Houot R, Manson G, Moles-Moreau MP, Orvain C, Bouabdallah K, Modi D, Ramchandren R, Lekakis L, Beitinjaneh A, Frigault MJ, Chen YB, Lynch RC, Smith SD, Rao U, Byrne M, Romancik JT, Cohen JB, Nathan S, Phillips T, Joyce RM, Rahimian M, Bashey A, Ballard HJ, Svoboda J, Torri V, Sollini M, De Philippis C, Magagnoli M, Santoro A, Armand P, Zinzani PL, Carlo-Stella C. Allogeneic transplantation after PD-1 blockade for classic Hodgkin lymphoma. *Leukemia*. 2021;35(9):2672–83. <https://doi.org/10.1038/s41375-021-01193-6>
54. Ramos CA, Grover NS, Beaven AW, Lulla PD, Wu MF, Ivanova A, Wang T, Shea TC, Rooney CM, Dittus C, Park SI, Gee AP, Eldridge PW, McKay KL, Mehta B, Cheng CJ, Buchanan FB, Grilley BJ, Morrison K, Brenner MK, Serody JS, Dotti G, Heslop HE, Savoldo B. Anti-CD30 CAR-T cell therapy in relapsed and refractory Hodgkin lymphoma. *J Clin Oncol Off J Am Soc Clin Oncol*. 2020;38(32):3794–804. <https://doi.org/10.1200/jco.20.01342>
55. Ramos CA, Ballard B, Zhang H, Dakhova O, Gee AP, Mei Z, Bilgi M, Wu MF, Liu H, Grilley B, Bollard CM, Chang BH, Rooney CM, Brenner MK, Heslop HE, Dotti G, Savoldo B. Clinical and immunological responses after CD30-specific chimeric antigen receptor-redirected lymphocytes. *J Clin Invest*. 2017;127(9):3462–71. <https://doi.org/10.1172/jci94306>
56. Daw S, Wynn R, Wallace H. Management of relapsed and refractory classical Hodgkin lymphoma in children and adolescents. *Br J Haematol*. 2011;152(3):249–60. <https://doi.org/10.1111/j.1365-2141.2010.08455.x>
57. Colita A, Colita A, Bumbea H, Croitoru A, Orban C, Lipan LE, Craciun OG, Soare D, Ghimici C, Manolache R, Gelatu I, Vladareanu AM, Pasca S, Teodorescu P, Dima D, Lupu A, Coriu D, Tomuleasa C, Tanase A. LEAM vs. BEAM vs. CLV conditioning regimen for autologous stem cell transplantation in malignant lymphomas. Retrospective comparison of toxicity and efficacy on 222 patients in the first 100 days after transplant, on behalf of the Romanian Society for Bone Marrow Transplantation. *Front Oncol*. 2019;9:892. <https://doi.org/10.3389/fonc.2019.00892>
58. Visani G, Malerba L, Stefani PM, Capria S, Galièni P, Gaudio F, Specchia G, Meloni G, Gherlinzoni F, Giardini C, Falcioni S, Cuberli F, Gobbi M, Sarina B, Santoro A, Ferrara F, Rocchi M, Ocio EM, Caballero MD, Isidori A. BeEAM (bendamustine, etoposide, cytarabine, melphalan) before autologous stem cell transplantation is safe and effective for resistant/relapsed lymphoma patients. *Blood*. 2011;118(12):3419–25. <https://doi.org/10.1182/blood-2011-04-351924>
59. Magalhaes-Silverman M, Lister J, Rybka W, Wilson J, Ball E. Busulfan and cyclophosphamide (BU/CY2) as preparative regimen for patients with lymphoma. *Bone Marrow Transplant*. 1997;19(8):777–81. <https://doi.org/10.1038/sj.bmt.1700733>

60. Hänel M, Kröger N, Sonnenberg S, Bornhäuser M, Krüger W, Kroschinsky F, Hänel A, Metzner B, Birkmann J, Schmid B, Hoffknecht MM, Fiedler F, Ehninger G, Zander AR. Busulfan, cyclophosphamide, and etoposide as high-dose conditioning regimen in patients with malignant lymphoma. *Ann Hematol.* 2002;81(2):96–102. <https://doi.org/10.1007/s00277-001-0413-8>
61. Wadehra N, Farag S, Bolwell B, Elder P, Penza S, Kalaycio M, Avalos B, Pohlman B, Marcucci G, Sobecks R, Lin T, Andrèsen S, Copelan E. Long-term outcome of Hodgkin disease patients following high-dose busulfan, etoposide, cyclophosphamide, and autologous stem cell transplantation. *Biol Blood Marrow Transplant J Am Soc Blood Marrow Transplant.* 2006;12(12):1343–9. <https://doi.org/10.1016/j.bbmt.2006.08.039>
62. Sureda A, Canals C, Arranz R, Caballero D, Ribera JM, Brune M, Passweg J, Martino R, Valcárcel D, Besalduch J, Duarte R, León A, Pascual MJ, García-Noblejas A, López Corral L, Xicoy B, Sierra J, Schmitz N. Allogeneic stem cell transplantation after reduced intensity conditioning in patients with relapsed or refractory Hodgkin's lymphoma. Results of the HDR-ALLO study – a prospective clinical trial by the Grupo Español de Linfomas/Trasplante de Médula Osea (GEL/TAMO) and the Lymphoma Working Party of the European Group for Blood and Marrow Transplantation. *Haematologica.* 2012;97(2):310–7. <https://doi.org/10.3324/haematol.2011.045757>
63. Das-Gupta E, Thomson KJ, Bloor AJC, Clark AD, Mackinnon S, Kayani I, Clifton-Hadley L, Patrick P, El-Mehidi N, Lawrie A, Kirkwood AA, Russell NH, Linch DC, Peggs KS. Allo-HSCT in transplant-naïve patients with Hodgkin lymphoma: a single-arm, multicenter study. *Blood Adv.* 2019;3(24):4264–70. <https://doi.org/10.1182/bloodadvances.2019001016>