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Pre-Existing Melanoma and Hematological Malignancies, Prognosis and Timing to Solid Organ Transplantation: A Consensus Expert Opinion Statement

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Abstract

Patients undergoing evaluation for solid organ transplantation (SOT) frequently have a history of malignancy. Only patients with treated cancer are considered for SOT but the benefits of transplantation need to be balanced against the risk of tumor recurrence, taking into consideration the potential effects of immunosuppression. Prior guidelines on timing to transplant in patients with a prior treated malignancy do not account for current staging, disease biology, or advances in cancer treatments. To update these recommendations, the American Society of Transplantation (AST) facilitated a consensus workshop to comprehensively review contemporary literature regarding cancer therapies, cancer stage specific prognosis, the kinetics of cancer recurrence, as well as the limited data on the effects of immunosuppression on cancer-specific outcomes. This document contains prognosis, treatment and transplant recommendations for melanoma and hematological malignancies. Given the limited data regarding the risk of cancer recurrence in transplant recipients, the goal of the AST-sponsored conference and the consensus documents produced are to provide expert opinion recommendations that help in the evaluation of patients with a history of a pre-transplant malignancy for transplant candidacy.

Introduction

The timing of when to perform a solid organ transplant (SOT) in patients with a history of prior malignancy depends on several variables. Some of these variables include the stage of cancer at diagnosis, the time from treatment, treatment response, as well as the organ needed and the degree of immunosuppression. The most cited guidelines for the selection of patients with pre transplant malignancy (PTM) for SOT were extrapolated from

recommendations made for potential renal transplant recipients, are outdated and in need of revision.¹ Previously, a minimum of two years, and frequently longer between cancer treatment and SOT was advised, regardless of staging and prognosis.

Although poorer outcomes are noted in recipients with PTM,^{2,3} it may or may not relate to recurrence of the cancer.^{2,4} More patients now emerge from contemporary cancer treatments with a good prognosis that will generally improve over time. In many cases, individual patient survival will be superior with transplant than without transplantation and be within acceptable transplant-specific outcomes. Recurrence does not necessarily mean death from the cancer, as modern therapies may effectively treat recurrent cancer. However, challenges will exist with optimizing graft function during these therapies. The effects of treating cancer recurrence with immunotherapy after SOT is beyond the scope of this review.

The risk of cancer recurrence after SOT and possible death of the patient and the loss of the organ also requires consideration of the ethical principle of justice. Balancing the fair distribution of a scarce resource with benefits of transplant for an individual patient with a PTM behooves us to provide updated recommendations for the transplant community to apply consistent, safe and collaborative input in selecting the appropriate transplant candidates.

Waiting time before transplantation for patients with PTM

The number of patients that would develop recurrent cancer during the waiting period prior to transplantation listing, and therefore, the effectiveness of the waiting period, is very dependent upon the shape of the recurrence curve versus time. Ideally, the curve would have a steep initial portion where most of the recurrence risk occurred, followed by a curve that is flat, suggesting a low risk after the initial waiting period. This would mean that the initial waiting time would capture much of the recurrence risk, with few recurrences happening later. A constant risk of recurrence over time makes a waiting period less effective in eliminating transplantation in patients who recur, as there is the same risk over time.

Consideration of a waiting period for patients with a specific cancer allows recurrence to appear but puts all patients—those who would recur and those who would not occur—at risk of death from underlying organ failure. For example, if there is a 5% chance of recurrence of cancer, and a 14% annual mortality rate for patients on dialysis⁵, for 100 patients with a treated PTM, over a two-year waiting period, 10 patients would be expected to have recurrence while 28 patients would die from end-stage renal disease. Avoiding transplantation in the four patients' decreases futile transplantation but at the risk of death of the other patients with a history of cancer. This creates a conundrum where a group of patients is taking on a burden of risk of dying to prevent futile transplantation, which also assumes no treatment response of the recurrent disease. This burden is much greater in patients with a high risk of dying from the underlying end-stage organ disease, and there may be different organ-specific strategies depending on alternative therapies such as dialysis or ventricular assist devices. The prevention of futile deceased donor transplantation would be less of an issue for living donor transplantation, though having a donor assume risk for a futile living donor transplant also raises concern. If a recipient is more likely to die of organ failure rather than recurrence, living donor transplant may seem to be a reasonable option.

Further complicating consideration is the possibility that cancer mortality could increase in such patients following transplantation if immunosuppression has an effect on cancer recurrence.

The Need for a Consensus

In 2019, the American Society of Transplantation (AST) conducted a survey of its members to assess practice patterns and institutional variations for selection of patients with PTM for SOT. Of the 80 respondents, most were medical (79%) and surgical (19%) transplant specialists from academic institutions (93%). There were deviations in the existence of institutional policies for listing those with PTM, utilization of an oncologist to assist with decision-making, and acceptable cancer-specific survival prior to consideration for transplant (Fig. 1). 77% of respondents were aware of prior published guidelines; however, more than 90% of respondents indicated a need for updated consensus for the management of patients with a PTM. Of note, most respondents considered a five-year cancer survival rate of 80% to be an acceptable benchmark before proceeding with transplantation.

Purpose and Scope of Consensus

The goal is of this consensus is to aid the transplant community in assessing the suitability and timing of transplantation after a successfully treated malignancy. The recommendations presented are limited to hematological cancers and melanoma. Other commonly encountered solid organ cancers, including breast, colorectal, anal, urological, gynecological, non-small cell lung cancers are discussed in a separate document. Recipient candidacy may be affected by the type of solid organ transplant needed, and immunosuppression required after transplant. It is important to consider the limitations of this document; while comprehensive, the recommendations cannot account for every clinical situation and consultation with oncology practitioners is encouraged.

Methods

The AST held The Malignancy and Transplantation Meeting on September 29–30, 2019 in Dallas-Fort Worth, Texas with the goal of producing recommendations of when a patient with a PTM should be considered a SOT candidate. The challenge faced at this meeting was navigating the timing and uncertainty of whether offering a transplant to a patient with a PTM will lead to loss of immune control of their cancer and initiate a cancer recurrence. Therefore, this meeting convened transplant physicians (including surgeons, medical specialists, and anesthesiologists) along with experts in surgical and medical oncology, and cancer epidemiology to review the current literature regarding contemporary cancer therapies, cancer stage-specific prognosis, the kinetics of cancer recurrence, and the limited data on the effects of immunosuppression on cancer-specific outcomes. There were over 30 participants in attendance at the meeting, where three experts in each of the fields of melanoma and hematological malignancies presented summaries of these diseases and their relation to transplantation. Discussion and consensus agreements were then made. Writing groups for each cancer consisted of the three cancer experts and two or more transplant physicians.

In light of progress made in medical and surgical oncology, past recommendations on timing to transplantation may be too restrictive in many circumstances. Unfortunately, compelling data from rigorous studies does not exist for the determination of waiting time before SOT after successful treatment of a PTM. Unfortunately, clinical studies to answer this question would be challenging to design while also considering all relevant variables (ex. life-saving vs life prolonging organ transplant, organ-specific levels of immunosuppression, type of cancer, and the availability of living donation). Although the authors have made the best recommendations possible, it is important to emphasize that there are significant gaps in knowledge, because much of the data is extrapolated from the general population. In addition, the recommendations are not meant to omit the valuable input oncologists play in appropriately selecting those to be transplant candidates, and we encourage ongoing discussions with our oncology colleagues. This document represents a consensus expert opinion; therefore, the levels of evidence were not graded.

Mechanisms of Cancer Recurrence After Transplantation

For most SOT recipients, immunosuppression is given to prevent acute and chronic rejection of the organ. While the exact mechanisms are unclear, the effects of an inefficient immune system likely create a variety of pathways for cancer recurrence. One potential mechanism is through decreased immune surveillance, where there is an accumulation of oncogenic mutations or cells that would otherwise be identified and repaired by the immune system. This mechanism may be predominant in skin cancers, where immunosuppression impairs the cells ability to repair ultraviolet radiation-induced DNA damage through defective nucleotide excision repair.⁶ Although logical, it is uncertain if a decrease in immune surveillance is the main contributor to the worse survival seen in patients with a PTM who develop a cancer recurrence after transplantation.²⁻⁴

Induction therapy with T cell depleting agents, increases the risks of cancers, such as melanoma.^{7,8} In addition, T cell depleting agents used in the treatment of acute rejection of the kidney allograft also increase the risk of cancer development.⁸ The mechanisms behind the short-term use of these therapies and the development or recurrence of cancer years later are incomplete. However, after T cell depletion, there is often an incomplete T cell recovery,⁹ which can have a long-term effect on immune homeostasis leading to an impaired immune system^{10,11} which can then predispose to the development or recurrence of cancer.

Malignant Melanoma

Background and Staging—Dramatic improvements in treatment outcomes for patients with melanoma over the past decade mandate a new review of transplant candidacy and cancer-free interval guidelines. Estimated melanoma-specific survival outcomes are commonly determined by staging according to the American Joint Committee on Cancer (AJCC) 8th Edition Melanoma Staging System, which takes into account the thickness of the primary tumor, presence of ulceration, number of tumor-involved regional lymph nodes and the presence of in-transit, satellite, and/or microsatellite metastases, as well as distant organ metastasis.¹² However, melanoma-specific survival estimates within the AJCC manual do not reflect the dramatic advances in both adjuvant therapy for resected high-risk melanoma and systemic therapy for metastatic disease, with associated

improvements in overall survival. With current therapeutic options, including immunological checkpoint blockade as well as the approved MAPK inhibitor regimens for BRAF mutant melanoma,^{13–16} the five-year overall survival rate for patients with metastatic melanoma is now greater than 50%. Given their efficacy in the metastatic setting, immunological checkpoint inhibition as well as targeted therapy have migrated to the post-resection setting, with a decrease in the risk of melanoma relapse of over 40%.^{17–20} Despite these favorable responses, it is unclear if cancer recurrence will increase post-transplant if the immune response towards the cancer that was facilitated by checkpoint inhibition is diminished by immunosuppression. This has been suggested by rare examples of donor derived malignancy from reportedly disease-free organ donors.²¹ Additionally, the use of checkpoint inhibitors in the transplant patient population is also evolving. A recent systematic review and meta-analysis summarized the available literature investigating the use of these therapies for treatment of a variety of cancers after a variety of solid organ transplants²². Although beyond the scope of this consensus review, these studies highlight the consideration that the immunological checkpoint inhibition for cancer therapy must be weighed against the risk of organ rejection and potential graft loss.

Data supporting concerns for poor post-transplantation outcomes/recurrence in patients with a pre-transplant history of melanoma is limited, with existing studies characterized by incomplete staging and treatment information.^{23–26} Melanoma-specific mortality is elevated three-fold in transplant recipients compared with non-transplant recipients, and was strongest for localized stage melanoma, suggesting that *de novo* melanoma behaves aggressively in the setting of immunosuppression.²⁷ This Scientific Registry of Transplant Recipients study is subject to the limitations of clinically relevant information, such as Breslow thickness, sentinel lymph node biopsy, and details on surgical treatment. The Transplant Cancer Match study determined recipients with pre-transplant melanoma had an absolute risk difference of 3% for post-transplant melanoma and a 30% increase in overall mortality (but not clearly or solely due to melanoma).²⁶

Expert Opinion Transplant Recommendations

To determine transplant eligibility, prior consensus guidelines considered the AJCC survival curves for each melanoma stage in combination with the post-transplantation survival rate goal.²⁸ If one accepts an 80% five-year melanoma-specific survival as a threshold for transplantation, then all patients with a pre-transplant melanoma diagnosis except for stage IIIC, IIID, and stage IV disease would be eligible following resection of disease. If the bar were raised to a 10-year melanoma-specific survival of 80%, then those with stage IA, IB, IIA, IIB, and IIIA would be eligible immediately following resection of disease. Thus, all patients with a pre-transplant diagnosis of locoregional melanoma (stages I, II, and possibly some patients with stage IIIa) may be transplant candidates. Imaging of the brain, chest, abdomen, and pelvis (and neck for those with a primary melanoma affecting the head or neck) are recommended for patients with a history of at least stage IIA melanoma prior to consideration for transplantation.

Recommendations for wait times prior to transplantation must take into consideration not only the absolute risk of disease recurrence, but also the kinetics of response (Table 1).

The five-year melanoma-specific survival for those with stage IA, IB, IIA, and IIIA is greater than 90%,¹² thus, we recommend a maximum of a 1-year wait time prior to transplantation for this group of patients, with one to two-year wait time for stage IIIA patients. The five-year melanoma-specific survival for those with stage IIB, IIC, and IIIB is greater than 80%, with a plateau observed on the survival curve beyond 5 years¹². Therefore, we recommend a wait time of two to four years prior to transplantation for this group of patients. Consideration for the effect of immunosuppression effects on patients with node positive disease controlled by checkpoint inhibition, needs to be included in the decision. In addition, the effects of checkpoint inhibition for treatment of melanoma may have unintended immunological consequences post-transplant, which should be a part of the informed consent process.

The five-year melanoma-specific survival for those with stage IIIC and IIID is between 30% and 70%, with a plateau observed on the survival curve at four to five years¹². Furthermore, the five-year overall survival rates for patients with metastatic melanoma is now over 35%, with long-lasting treatment responses even after discontinuation of active checkpoint inhibitor therapy.^{16,29} Institution of a wait time of at least five years prior to transplantation would be expected to prevent transplantation of most of this group of patients who will develop fatal melanoma recurrence. Concern for the effect of immunosuppression on the immune control incited by the checkpoint inhibitors is high in this population. In addition, given the potential for organ rejection with checkpoint inhibitor therapy in recurrent melanoma after transplantation,²² no consensus recommendation could be reached regarding transplantation of this group of patients, including patients with stage IV disease; therefore, we recommend that such cases be discussed on an individual basis.

Hematological Malignancies

Lymphoma—There are more than 100 subtypes of lymphoma. Diffuse large B-cell lymphoma (DLBCL) has the highest prevalence, followed by follicular lymphoma, marginal zone lymphoma, and mantle cell lymphoma.³⁰ DLBCL, high-grade B-cell lymphoma with MYC and/or BCL2 and BCL6 rearrangements, Burkitt lymphoma, and other aggressive lymphomas are potentially curable. In contrast, follicular lymphoma (FL), marginal zone lymphoma (MZL), mantle cell lymphoma (MCL) and other low-grade lymphomas have a long survival time but are not curable and respond to different therapies over time.³⁰

Approximately 65–75% of patients with DLBCL are cured with standard of care chemotherapy. However, variable outcomes can be predicted based on clinical factors.³¹ Patients who have not relapsed or have their cancer progress two years after treatment of their DLBCL (achieved progression-free survival; PFS24) have excellent outcomes. After PFS24 is obtained, overall survival is defined as time from achieving PFS24 to death from any cause, and these patients have a 5-year survival of 87.6%, which is similar to an age- and sex-matched cohort from the general population.³²

For patients with follicular lymphoma, Rituximab combined with immunochemotherapy has improved their overall survival. For example, if a patient achieves an event-free survival of 24 months (EFS24) after treatment with immunochemotherapy, they have no greater mortality when compared to the general population.³³ Furthermore, in a pooled analysis of

FL grade 1–3a in the immunochemotherapy era, the 10-year overall survival approximates 80%.³⁴

The outcomes of Hodgkin lymphoma are very good, even in patients with advanced disease. At a median follow-up of 6.4 years, the complete remission rates are 73% and the failure-free survival was 74% for all patients treated with standard of care chemotherapy.³⁵ Most relapses occur within two years of treatment.

The T-cell lymphoproliferative disorders are a complex group of diseases. If the EFS24 is achieved, it associates with improved survival with 78% of patients surviving 5 years.³⁶ Burkitt lymphoma is a malignancy characterized by rapid tumor growth, with a two-year event-free survival rate of 80%. For patients in complete remission, the two-year relapse risk was 6%, and further decreased to 0.6% for patients reaching 12 months of post-remission event-free survival.³⁷

Monoclonal B-cell lymphocytosis (MBL), a pre-malignant condition, precedes all cases of chronic lymphocytic leukemia (CLL).³⁸ MBL is typically an incidental finding, with an estimated prevalence of ~5–12% in patients over the age of 60 years. It has a very favorable prognosis. CLL is a complex low-grade lymphoproliferative disorder. New therapeutic interventions have significantly changed outcomes for these patients.³⁹ The CLL international prognostic index (IPI) includes five factors that are independently associated with survival, including age ≥ 65 (1 point), clinical Rai stage greater than 0 (1 point), unmutated immunoglobulin heavy chain gene (2 points), beta 2 microglobulin greater equal 3.5 mg/L (2 points), and a deletion(17p13) or *TP53* mutation (4 points).⁴⁰ Among patients with untreated CLL, the CLL-IPI score can predict the five-year treatment-free survival: 78% in the low-risk group (score 0–1), 54% in intermediate-risk group (score 2–3), 32% in high-risk group (score 4–6) and 0% in the very high-risk group (score 7–10). Of note, these survival predictions do not consider the potential for cancer recurrence in the setting of immunosuppression. However, there is limited experience with eight patients with MBL or CLL who received a renal transplant found no post-transplant lymphoproliferative disorder. In addition, after a median follow-up of 52 months, no patient had progression of the underlying CLL.⁴¹ The recommended waiting times before transplant are listed in Table 2.

Multiple Myeloma—Renal failure can complicate the treatment of multiple myeloma, necessitating discussions of renal transplant candidacy. Currently, myeloma remains incurable. Overall and progression-free survival is determined by response depth^{42,43}, but relapse inevitably occurs. However, the patients who have the longest progression-free survival have achieved minimal residual disease negativity in the bone marrow and a stringent complete response by measurement of the monoclonal proteins and bone marrow plasma cells (Table 3). Median progression-free survival is 63 months with modern therapy, and overall survival at ten years is over 60%^{42,43}. Achievement of a state of minimal residual disease negativity should be a strong consideration before agreeing to proceed with renal transplantation.

Prognosis is also driven by fluorescence in situ hybridization (FISH) genetics. Patients who have high-risk genetics have a much shorter progression-free and overall survival compared

to patients with standard-risk genetics.⁴² For example, patients with deletion(17p), t(4;14), or t(14;16) have a 3.6 times higher mortality and 2.3 times lower progression-free survival. Event free survival for deletion(17p) varies from 14–28 months and overall survival is 49% at 4 years, based on therapeutic options available. t(4;14) has an event free survival of 21–28 months with an overall survival of 44–66% at 4 years.

Today, the standard of care for maintenance therapy in multiple myeloma patients in deep response is low dose lenalidomide therapy. Unfortunately, there are multiple reports of renal allograft rejection, resulting from lenalidomide therapy.⁴⁴ Five new active agents have been approved for the treatment of multiple myeloma, therefore, only trials after 2012 truly represent renal graft survival. A number of recent reports indicate that patients who are in remission for six to 12 months become safe candidates for renal transplantation if stem cell transplantation is part of the regimen to deepen response^{45,46}. No data are available for non-kidney SOT, but other organ transplantation may be a consideration.

Amyloid—To consider a patient with Amyloid light-chain (AL) amyloidosis for heart transplant, the patient must be willing to potentially have a stem cell transplant as part of post-transplant management, although many patients may be managed with chemotherapy after heart transplant and avoid bone marrow transplant. In one series of cardiac transplantation recipients with AL amyloidosis, 14 received a heart only, and 2 received a heart and a kidney; the Kaplan Meier curve at five years showed a 76.6% survival.⁴⁷ Amyloidosis is a common cause of end-stage renal disease, with nearly one third of patients ultimately requiring renal replacement therapy. A deep response to treatment is required to prevent recurrent amyloidosis⁴⁸, where survival at ten years is 80%. Renal transplantation has been performed a median of 2.4 years after hematologic response occurred, and a minimum duration of hematologic response of six to 12 months prior to renal transplantation (Table 3). Graft survival at ten years exceeded 60% and the median survival from renal transplantation was 10.5 years. No data exist for other SOT recipients.

Myelodysplastic Syndrome—Renal failure has occurred after bone marrow transplant for myelodysplastic syndrome. Consideration for renal or any transplant is dependent on pre-transplant karyotype.⁴⁹ Patients that have low-risk genetics have less than a 20% chance of relapse at 12 years. Patients with high-risk genetics have a 50% chance of relapse at four years. Discussions between the transplant team and hematology, to determine the overall risk of transplantation, are needed.

Expert Opinion Transplant Recommendations

Transplant can generally be considered after 2 years in remission for many lymphoproliferative diseases (Table 2). In select circumstances, myeloma, amyloidosis, and myelodysplastic disease may not preclude transplant options (Table 3).

Conclusions

Pre transplant malignancy is common in patients with end-stage organ disease undergoing evaluation for SOT, and the presence of a PTM can affect post-transplant outcomes. With advances in the contemporary therapy of cancer with improved overall survival, an

updated consensus document on when to transplant patients with PTM was deemed a high priority by the AST. The importance of standardized surveillance of patients with a PTM after transplantation was also recognized and guidance is being created by this group. Recognizing the paucity of data surrounding the recurrence of melanoma and hematological malignancies, this conference and consensus documents can only aim to update *expert opinion recommendations* for proceeding with SOT given a history of a PTM. In order to improve the strength of these recommendations, prospective data from patients transplanted within these guidelines must be collected and shared, and is currently an initiative within the AST's Liver and Intestinal Community of Practice.

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Abbreviations:

AJCC	American Joint Committee on Cancer
AST	American Society of Transplantation
AL	Amyloid light-chain
CLL	Chronic lymphocytic leukemia
DLBCLL	Diffuse large B-cell lymphoma
EFS24	Event free survival at 24 months
FISH	Fluorescence in situ hybridization
FL	Follicular lymphoma
MCL	Mantle cell lymphoma
MZL	Marginal zone lymphoma
MBL	Monoclonal B-cell lymphocytosis
PTM	Pre-transplant malignancy
PFS24	Progression-free survival at 24 months
SOT	Solid-organ transplantation

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Does your institution have a written set of guidelines on waiting time prior to evaluating patients for solid organ transplantation after a diagnosis of cancer?

When evaluating a patient for transplant after a diagnosis of malignancy, how often is an Oncologist consulted to provide expert opinion regarding survival?

In your opinion, what is an acceptable 5-year cancer survival to consider a patient for transplant?

Figure 1.
AST Survey Results.

Table 1:

Recommended wait time for SOT candidates with a prior history of melanoma.

Pathological Stage	5-year MSS ¹²	Appropriate Treatment Pre-Transplantation	Time Interval to Transplant	Additional Considerations
In situ	99%	Wide local excision	No wait time necessary	Follow up three months post SOT
Stage IA (T1a)	99%	Wide local excision	1 year	
Stage IB (T1b or T2a)	97%	Wide local excision plus SLNB	1 year	If positive SLNB at time of diagnosis, imaging as for Stage IIA disease
Stage IIA (T2b or T3a)	94%	Wide local excision plus SLNB	1 year	Imaging of the brain, CAP Imaging of the neck for those with head/neck melanoma primary
Stage IIB (T3b or T4a)	87%	Wide local excision plus SLNB	2–4 years	Imaging as above
Stage IIC (T4b)	82%	Wide local excision plus SLNB	2–4 years	Imaging as above
Stage IIIA (T1–2a, N1a or 2a)	93%	Wide excision plus SLNB plus lymph node dissection	1–2 years	Imaging as above Oncology referral
Stage IIIB (T0–3a and N1a/b/c, N2a/b)	83%	Wide excision plus SLNB plus lymph node dissection Adjuvant therapy with CKI	2–4 years	Imaging as above Oncology referral
Stage IIIC (T3b–4b and N2b/c–N3b/c)	69%	Wide excision plus SLNB plus lymph node dissection, Adjuvant therapy with CKI	At least 5 years	Imaging as above Oncology referral (no consensus was possible for this group)
Stage IIID (T4b and N3a–3c)	32%	Wide excision plus SLNB plus lymph node dissection Adjuvant therapy with CKI	At least 5 years	Oncology referral (no consensus was possible for this group)
Stage IV	15–20%	Wide excision plus SLNB plus lymph node dissection Adjuvant therapy with CKI	At least 5 years	Oncology referral (no consensus was possible for this group)

MSS: melanoma specific survival, SLNB: sentinel lymph node biopsy, CKI: checkpoint inhibitor CAP: chest, abdomen and pelvis

Table 2:

Recommended wait time for SOT candidates with a prior history of hematological malignancies.

Histology	Survival / Relapse Data	Time Interval to Transplant	Additional Considerations
Diffuse large B-cell lymphoma	Survival is equivalent to age- and sex-matched general population after EFS24 and PFS24 achieved ^{27,28}	2 years	
Follicular lymphoma	No added mortality when compared to age-and sex-matched general population after EFS24 achieved ^{29,30}	2 years	
Peripheral T-cell lymphoma, NOS	23% relapse within 5 years of EFS24, 78% 5-year survival after EFS24 achieved ³²	2 years	
Burkitt Lymphoma	0.6% relapse after EFS24 achieved ³³	2 years	
Hodgkin lymphoma	10% relapse at 10 years after EFS24 achieved ³¹	2 years	PET scan negative patients after initial treatment have a low rate of relapse
Monoclonal B-cell lymphocytosis	N/A	No wait time	
Chronic lymphocytic leukemia	83% 5-year survival untreated ³⁶	2–3 years after treatment	Consider if in remission with no CLL-IPI scores greater than 4

EFS24: Event Free survival at 24 months, PFS24: Progression Free Survival at 24 months

Table 3:

Criteria for safe SOT candidates with a prior history of Myeloma (top) or Amyloidosis (bottom).

Criteria for Safe Renal Transplantation in Myeloma
Stringent complete response:
No monoclonal protein in serum or urine by immunofixation,
Normal free light chain ratio
Bone marrow plasma cells <1% by flow or immunohistochemistry
Performance status 0 or 1
FISH at diagnosis fail to demonstrate deletion (17p), t(4;14), t(14;16)
Hematologic remission > 6 months
Criteria for Organ Transplantation in Amyloidosis
Therapeutic response with dFLC of <4 mg/dL
Only one organ involved with amyloidosis
Does not fulfill criteria for symptomatic myeloma
Must be a candidate for stem cell transplantation following organ transplantation

dFLC: difference between involved minus uninvolved serum free light chains