THE ROLE OF HEMATOPOIETIC STEM CELL TRANSPLANTATION IN TREATING BLOOD CANCER

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- Krishna Komanduri, MD: Consultant for: Aegle Therapeutics, Avacta Life Sciences, Cargo Therapeutics, CRISPR, Incyte, Iovance, Genentech/Roche, Janssen, Novartis, OptumHealth
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- Lesley Hoerst, BSN, RN: None
- Lauren Berger, MPH: None
- Camille Dyer, MS, PA-C, AACC, DFAAPA: None

EDUCATIONAL OBJECTIVES

After completing this CE activity, the participant should be better able to:

• Describe the goals and types of hematopoietic cell transplantation used in the treatment of blood cancers, including autologous, allogeneic, and reduced-intensity allogeneic stem-cell transplantation
• Describe the indications for hematopoietic stem cell transplant
• Explain the process of pre-transplant evaluation, mobilization, cell collection, and cell infusion in patients with blood cancer
• Explain the short and long-term follow up requirements
• Identify resources for patient education and support
CONTINUING EDUCATION

Approval for nurses has been obtained by The Leukemia & Lymphoma Society National Office under provider number CEP 5832 to award 1.0 continuing education contact hour through the California Board of Registered Nursing.

This activity has been reviewed by the AAPA Review Panel and is compliant with AAPA CME Criteria. This activity is designated for 1 AAPA Category 1 CME credits. Approval is valid from 3/23/2023 to 3/23/2024. PAs should only claim credit commensurate with the extent of their participation. AAPA reference number: CME-206402.

Hematopoietic Stem Cell Transplantation and CAR-T Therapies for Blood Cancers

Krishna Komanduri, MD
Corinne Shamehdi, PA-C
Alfred Velpeau Describes Leukemia in 1825

1825-1950: ~1000 Publications About Leukemia

1960s
Combination chemotherapy + stem cell transplants

1825
First description of acute leukemia

1950-2000: ~175,000 publications about leukemia
What is a Stem Cell?


Concept of Myeloablative Stem Cell Transplant

Before

After

Recipient

Donor

Donor Graft

Conditioning

and/or
Categories of Stem Cell Transplants

- Autologous or “auto” uses patient’s own cells
- Allogeneic or “allo” uses cells from a donor, who may be a family member
- Haploidentical or “haplo” uses cells from a half-matched family member, usually a parent or child (but occasionally a sibling or grandchild)
- Unrelated donors may be matched “MUD” or mismatched “MMUD”
- Syngeneic = stem cells from a monozygotic identical twin (uncommon)

T Cell Depletion is Associated with Increased alloSCT Relapse

Efficacy of Donor Lymphocyte Infusions Provides Rationale for T-Cell Therapy

CLL Progression Responds to Donor Lymphocyte Infusion

Pre 1 2 3 4 5 6 7 8 9 10 11 12
Months After Transplant

VH lgG Quantification
Copies/µg DNA

Rituximab

3 x 10^7 CD3 DLI

CD3 Donor Chimerism

0% 20% 40% 60% 80% 100%

CD3 Donor Chimerism

T cells in Donor Transplant Grafts Eliminate Residual Cancer

GVT

Pathogen-specific immunity

GVHD

b) TRES

c) Tumor-reactive T cells

d) TIL

Riddell & Appelbaum, Graft v. Host Disease, PLOS Medicine, 2007
...but can attack healthy tissues in the patient

Riddell & Appelbaum,
Graft v. Host Disease,
PLOS Medicine, 2007

Improving Immune Outcomes of Stem Cell Transplants

Can we selectively inhibit these...

Riddell & Appelbaum,
Graft v. Host Disease,
PLOS Medicine, 2007

without impairing these?
Pre-Transplant Conditioning

- Chemotherapy, immunotherapy, and/or radiation therapy prior to transplant that prepares the patient for HSCT

  - **Autologous conditioning**
    - High doses of chemotherapy that kill malignant cells
    - Requires stem cell rescue
  
  - **Allogeneic conditioning regimens**
    - Eradicate malignant cells
    - Immunosuppress the recipient to prevent rejection
Conditioning Regimen Intensity

**Categorized into 3 groups based on level of intensity:**

**Myeloablative (MA)**
- Cause irreversible (or near irreversible) pancytopenia
- Stem cell rescue is required to restore marrow function and prevent aplasia-related death

**Non-myeloablative (NMA)**
- Produces moderate-to-minimal cytopenia

**Reduced Intensity Conditioning (RIC)**
- Intermediate: likely ablative but much less intensive than standard MA regimens

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Conditioning: Goals and Principles

- Provide tumor cytoreduction and eradicate any remaining tumor cells
- Provide adequate immune suppression to overcome host rejection of the donor graft (alloSCT)
- Avoid therapies with overlapping toxicity profiles

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Reduced-Intensity Conditioning Facilitates a Dramatic Expansion of Transplantation in Older Adults (2004-2014)

Goals of Hematopoietic Stem Cell Transplants

- Restores normal hematopoiesis in BM failure syndromes
- Replaces disease marrow with healthy marrow
- Serves as a “rescue” following marrow-ablative treatments
- Serves as a means of correct congenital immunodeficiency disorders or other genetic diseases
  - Replaces a missing or abnormal hematopoietic or lymphoid component
- Establishes a graft-vs-leukemia (tumor) effect (alloSCT)
Allogeneic Stem Cell Transplantation: Evolution and Limits

- Since the 1980s, alloSCT has evolved from ablation to immunotherapy
- The use of less intensive conditioning expanded eligibility from <55 to 75 (or older)
- Peripheral blood HCT and improved supportive care have substantially decreased non-relapse mortality (from ~30-40% to 5-10% in the first 100 days after alloHCT)
- Typical results for AML: 5-10% 100-day and 30% one-year mortality (~50:50 NRM:relapse)
- GVHD is still a major problem, in acute (10-30% severe) and chronic (20-70%) forms
- Immunosuppression has modestly improved in 50 years and is largely non-selective
- Only three GVHD therapies (JAK1/2 inhibition for acute; ITK/BTK and ROCK2 inhibition for chronic) approved in 50 years

The First Half Century of Stem Cell Transplant History

- Twin-twin transplantations
- Initial report on use of BMT as cancer treatment
- Calcineurin inhibitors to prevent graft-versus-host disease
- Allogeneic BMT for immunodeficiency
- Successful BMT for leukemia
- Cure of lymphoma with autologous BMT
- Recognition of human graft-versus-leukemia effect
- Cure of aplastic anemia with BMT
- Cure of sickle cell anemia with BMT
- BMT for radiation accident
- Initial clinical use of HLA skin-grafting experiments
- Successful canine littermate BMT
- Recognition of human graft versus-leukemia effect
- Cure of thalassemia with BMT
- Successful transplantation from unrelated donor
- Introduction of reduced-intensity transplants
- Remission with donor lymphocyte infusion
- Imatinib mesylate for chronic myelogenous leukemia
- Publication of negative breast cancer study
Indications for Autologous Transplantation

<table>
<thead>
<tr>
<th>Non-Hodgkin’s lymphoma</th>
<th>Hodgkin’s lymphoma</th>
<th>Myeloma</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Follicular: poor response or initial remission duration &lt;12 months, transformation to DLBCL</td>
<td>• Primary induction failure or relapse</td>
<td>• All patients after initiation of therapy</td>
</tr>
<tr>
<td>• DLBCL or high grade lymphomas: at first or subsequent relapse, CR1 for high and high-intermediate IPI risk, refractory disease</td>
<td>• CR2 and beyond</td>
<td>• At first progression</td>
</tr>
<tr>
<td>• Mantle cell: after initiation of therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Other high risk lymphomas: after initiation of therapy</td>
<td></td>
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</tbody>
</table>
### Indications for Allogeneic Transplantation

#### AML
- CR1 – except favorable risk
- Antecedent hematological disease
- Treatment related leukemia
- Primary induction failure or relapse
- Presence of minimal residual disease after initial or subsequent therapy
- CR2 and beyond

#### MDS
- Any intermediate or high IPSS score
- Any MDS with poor prognostic features (i.e., treatment related, refractory cytopenias, adverse cytogenetics)

#### CML
- Inadequate hematologic or cytogenetic response after multiple tyrosine kinase inhibitors (TKI)
- Intolerance to TKIs
- Accelerated phase
- Blast crisis

#### ALL
- CR1
- Primary induction failure or relapse
- Presence of minimal residual disease after initial or subsequent therapy
- CR2 and beyond

#### CLL
- High-risk cytogenetics or molecular features (deletion 17p or 11q)
- Fludarabine resistant
- Richter’s transformation
- Poor initial response or short initial remission (recurrence within 12 mo)
Transplant Eligibility

- Clinical Factors
  - Health and performance status
  - Disease status, chemosensitivity
  - Identification of psychosocial issues that would interfere

- Donor Factors
  - Stem cell source
  - Related vs Unrelated

- Other
  - Psychosocial evaluation, caregiver support

- Transplant center requirements
  - Access

**Phases of Transplant**

- **Pre-Transplant**
  - Conditioning chemotherapy
  - GVHD and anti-inflective prophylaxis

- **Transplant (Day 0)**
  - Infusion of stem cells

- **Post-Transplant**
  - Complications
  - GVHD (acute and chronic)*
  - Graft Failure*
  - Relapse

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**Bone Marrow Harvest**

- Bone Marrow Harvest
  - General anesthesia/surgical procedure
  - Multiple aspirations of posterior iliac crest
  - Equivalent of 50-100 bone marrow biopsies

- Collection goal
  - 10-20 mL/kg recipient weight = total nucleated cell (TNC) 2-4 x 10^8 /kg
  - Volume 1500 mL

- Limited by health of the donor
- Low complication rate
  - < 0.3% serious adverse events
- Recovery in a few days

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Peripheral Blood CD34+ Stem Cell Collection

- Requires cells to be “mobilized” prior to collection
  - CD34+ cell - Circulating cells in the blood stream with a surface antigen transmembrane glycoprotein that is present on immature hematopoietic cells (as well as endothelial and stromal cells)
  - Agents
    - Filgrastim, sargramostim, plerixafor
    - Chemotherapy (use in autologous donations only)
- Procedure is similar to a session of dialysis
  - Cells are collected via an apheresis catheter
  - CD34+ cell count by flow cytometry
    - Auto HSCT goal: 2.5 x 10e6 /kg (adult)
    - Allo HSCT goal: 4.6 x 10e6 /kg (adult)
    - Up to 10 x 106 /kg depending on number of planned HSCTs
- May require several collections
- Risks are minimal: anemia, thrombocytopenia, hypocalcemia, hypotension, thrombosis

Umbilical Cord Blood

- Majority donated through anonymous public banks, less often via direct family member
- Most common in pediatric HCT
- Collection
  - Cord blood is collected at time of placenta delivery from umbilical cord vein
  - Cell dose 2.5 to 3 x10e7 TNC /kg
- Advantages: less stringent HLA matching, lower incidence of cGVHD
- Disadvantages: delayed engraftment, graft failure, higher rate of infectious complications, higher costs
- ADVANCES: double cord blood HCT, ex vivo expansion techniques
Day 0 (Stem Cell Infusion)

- Stem cells may be infused fresh within a few hours of collection
- May be frozen using DMSO
  - Complications
    - Garlic smell/taste
    - Facial flushing
    - Tickling sensation
    - Rare: bradycardia, abdominal pain, encephalopathy, seizures, renal failure
      - Prevention: divide large volume infusions over 2 days and infuse cells slowly
      - Pre-medications to prevent reactions
- ABO mismatched
  - Watch for hemolytic reactions

Common Complications of HCT

- Nausea, Vomiting, Diarrhea
- Mucositis and Pain
- Cytopenias
- Infection
- Graft vs Host Disease (acute and chronic)*
- Organ Injury/Toxicity
  - Veno-occlusive Disease (VOD)/ Sinusoidal Obstruction Syndrome (SOS)
  - Brochiolitis Obliterans (usually a late manifestation of cGVHD)
  - Thrombotic Microangiopathy (TMA, usually related to GVHD prevention)
- Graft failure
- Relapse

General Supportive Care: Nausea and Vomiting

Management

- Medication options for breakthrough N/V (goal is to add one agent at a time from a different drug class to the existing N/V regimen)
  - Dexamethasone 4mg IV Q8-12h requires Attending approval (corticosteroid)
  - Diphenhydramine 25mg IV Q8h (histamine type 1 antagonist)
  - Dronabinol 5-10mg PO Q6-8h (cannabinoid)
  - Haloperidol 1-2 mg IV/PO Q6h (dopamine antagonist)
  - Lorazepam 0.5-2mg IV Q6h (benzodiazepine)
  - Metoclopramide 20mg IV Q6h (dopamine antagonist)
  - Olanzapine 2.5-5mg PO orally-disintegrating tab Q12h (atypical antipsychotic)
  - Ondansetron 8mg IV Q8h (serotonin antagonist)
  - Prochlorperazine 10mg IV Q6h (phenothiazine)
  - Scopolamine patch 1.5mg transdermal Q72h for movement related N/V (anticholinergic)
General Supportive Care: Diarrhea

Management options:
- Manage any infectious causes as appropriate
- Medications for non-infectious diarrhea

1st line: Loperamide (Imodium®) 4 mg PO x 1 dose, then 2 mg PO Q4h for every unformed stool (max 16 mg/day)

2nd line: Add diphenoxylate/atropine (Lomotil®, 2.5mg/0.025mg) 2 tabs PO Q6h or mL PO Q6h (max 20 mg diphenoxylate/day)

3rd line options:
- Octreotide*
- Opium tincture* *Discontinue within 24 hrs after the resolution to avoid the development of ileus

- Assess patient every 12-24 hrs

What is Graft-Versus-Host Disease?

GVHD is a systemic disorder that occurs when the graft's immune cells recognize the host as foreign and attack the recipient’s body cells.

“Graft” refers to donor-derived cells and “host” refers to the tissues of the recipient
Graft versus Host Disease (GVHD)

- Major complication among all patients receiving allogeneic HSCT
  - ~30–50% of patients, with 14–36% developing severe aGVHD
  - 30-70% will have some chronic GVHD

- Most common cause of NRM after allogenic HSCT
  - Only 25–30% of patients with grade III aGVHD and 1–2% of patients with grade IV aGVHD surviving long term (>2 years)

- Increases health care cost and length of stay
- Significant driver of decreased quality of life (especially cGVHD)

Typical Kinetics of Acute and Chronic GVHD

**Manifestations of Acute GVHD**

**Skin**
- Itchy, painful sunburn-like rash
- Often found on the palms of hands or the soles of feet

**GI**
- Upper (anorexia, nausea/vomiting)
- Lower (diarrhea, abdominal pain)

**Liver**
- Hyperbilirubinemia, jaundice

**Immune System**
- Lower blood counts and increased risk of infections

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**Manifestations of Chronic GVHD**

#1 Skin
#2 Liver
#3 Oral
#4 Ocular
#5 GI
#6 Immune
#7 Musculoskeletal
#8 GU
#9 Pulmonary

Approaches (Most Experimental) to Prevent and/or Treat GVHD

- Stem cell graft engineering
  - Anti-thymocyte globulin
  - Post-transplant cyclophosphamide
  - CD34 selection
  - Ex vivo pan-T cell depletion
  - Ex vivo selective T cell depletion
  - Donor IL-2 therapy

- Inhibit T cell signaling
  - mTOR inhibition - everolimus
  - JAK1/2 inhibition - tofacitinib
  - ROCK2 inhibition - KX025
  - bortezomib

- Adoptive Treg Therapy
  - Purified donor Treg
  - Ex vivo expanded Treg
  - Antigen-specific Treg

- B cell depletion in vivo
  - Rituximab
  - Ofatumumab
  - Obinutuzumab

- Inhibit B cell signaling
  - BLK inhibition - ibritumomab tiuxetan
  - CSF inhibition - tissotanib

- Treg sparing therapy
  - adalimumab
  - mycophenolate mofetil
  - tacrolimus
  - bortezomib

- In vivo Treg expansion
  - ECP
  - Low-dose IL-2

Mechanistic approaches for the prevention and treatment of chronic GVHD. Cutler CS, Koreth J, Ritz J. Blood. 2017

Infection Risk by Transplant Phase

- Phase I: Pre-engraftment
  - Neutropenia, barrier breakdown (mucositis, central venous access devices)
  - Graft versus-host-disease: Acute

- Phase II: Post-engraftment
  - Impaired cellular and humoral immunity; NK cell recovery first. CD8 T cell numbers increasing but restricted T cell repertoire

- Phase III: Late phase
  - Impaired cellular and humoral immunity; B cell & CD4 T cell numbers recover slowly and repertoire diversifies

Primary Causes of Mortality

**Autologous SCT**
- Early mortality now rare (<1-2% at most centers)
- Primary cause of mortality is relapse (some non-relapse mortality, most often due to infections)

**Allogeneic SCT**
- Nonrelapse mortality more common—increased with comorbidities, advanced disease, more intensive conditioning
- GVHD mortality is often related to infections and happens with degree of mismatch (though improving significantly over time)

Phases of Care and Typical Care Requirements

**Inpatient hospitalization**
- Beginning of conditioning to resolution of acute toxicity after engraftment

**Early ambulatory phase (~d+30 for auto, ~d+100 for allo)**
- Visits typically 1-3x/week depending on complications

**First year after SCT (beyond ~d+30 for auto, ~d+100 for allo)**
- Visit frequencies typically decline to monthly depending on active issues
- Care typically transitions to primary oncology team away from cellular therapy center (with coordination between both teams)
- Communication and clear patient understanding critical
The HLA Barrier: Need for an HLA-matched donor

High-resolution donor-recipient HLA matching contributes to the success of unrelated donor marrow transplantation

- Historically, mismatched URD transplants associated with worse survival
- Roughly 10% decrease in survival for each HLA mismatch

However, a Fully Matched Registry Donor is Not Available for Every Patient

- 29% Black or African American
- 47% Asian or Pacific Islander
- 48% Hispanic or Latino
- 60% American Indian and Alaska Native
- 79% White
And, it’s getting MORE DIFFICULT to match over time

54% 60 and over

34% 20 and under

1960s 1980s 2000s

Mismatched grafts close the disparity gap

- Registry modeling from BTM Bioinformatics
- Successful 7/8 transplants increase donor availability to 72% for AFA pts
- Successful 6-7/8 transplants increase donor availability to 97% for AFA pts

AFA = African American
API = Asian Pacific
CAU = Caucasian
HIS = Hispanic/Latino
NAM = Native American
Post-transplant cyclophosphamide (PTCy) enhances GvHD prevention in the haploidentical setting

15-MMUD Study
Primary Endpoint: Overall Survival
72% MAC and 79% RIC
**Primary endpoint is 1 year OS in each adult cohort**

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**Trends in Stem Cell Transplantation**

- **AutoSCT** remains most common type, 65% of all HSCTs
- **Decrease in autoSCT** for lymphoma and myeloma  
  - New therapies (BTKIs, antibodies, immunotoxins, CAR-T cell)
- **Increased use of alloSCT**  
  - Increased use of haplo donors  
  - Increase in unrelated donors including mismatched unrelated donors  
  - Major trend is increase in post-transplant cyclophosphamide
- **Everyone now has a suitable transplant donor!**
CAR T Cells: Mechanism of Action

T cell
- Expression of CAR
- Viral DNA Insertion

Tumor cell
- CAR enables T cell to recognize tumor cell antigen
- Antigen
- CAR T cells multiply and release cytokines
- Tumor cell apoptosis
Refractory Lymphoma Remission After CAR-T therapy

Neelapu, et al., NEJM December 2017

The Development of the Registry Parallel to the Expansion of the Field of Cellular Immunotherapy

NCI funded CT Registry Pilot
Launch of the Cellular Therapy Registry
Approval of LympH Approval of Yescarta
Approval of Tecartus Approval of Belzutin Approval of Aseyta
Yescarta as Second Line for DLBCL Tecartus for adult ALL Yescarta for Follicular Lymphoma
CD19 CAR-T therapy for Lymphoma is Curative

Progression-free Survival


Optimizing CAR-T therapy: Model by Spiegel and Miklos

Tumor Biology:
- Tumor Antigen Density
- Tumor microenvironment

Patient
CAR-T Product
Apheresis Transfection CAR-T Product
Infusion
CAR-T Product Fitness:
- Patient T cell fitness
- CAR-T construct
- CAR-T manufacturing

PRE-THERAPY
DAY 60 RELAPSE

Tumor Biology:
- Tumor Antigen Density
- Tumor microenvironment

CAR-T Pharmacokinetics and Pharmacodynamics
- Characterize which CAR-T localize to tumor
- Immune Phenotype of CAR-T blood expansion

from Spiegel and Komanduri, Blood Feb 17, 2022
ARE THERE ACCESS/EQUITY BARRIERS TO CELLULAR THERAPIES?

- All CAR-T therapies, in aggregate, are underutilized
- High cost, tertiary/quaternary therapies tend to maximize historical barriers to access (racial, socioeconomic, logistical)
- Early data suggest that African American patients are less likely to receive CAR-T therapy, and may have lower ORR, CR rates
- Unique access issues exist for pediatric patients, for whom fewer options exist
- Cost and complexity of access and care compound historic barriers
- Similar (sadly) to what was historically seen with stem cell transplants, also commonly underutilized
Cellular Therapy is a (highly rewarding) Team Sport

Cellular therapy is a highly complex specialty requiring a specialized multi-disciplinary team
- Attending Physicians
- Advanced Practice Providers (PAs and NPs)
- Pharmacists (often with PharmD and subspecialty oncology training)
- Nurses
- Nutrition (RD)
- Physical Therapy
- Social Work/Case management
- Specialty Consult Services (Infectious Disease, GI, Pulmonary, etc.)
Cellular Therapy Nursing

Nurses play a vital role in the daily assessment and delivery of care of cell therapy patients

Supportive care
- Fatigue
- Shortness of breath
- Fever/infection
- Bleeding
- Fluid status (hypovolemia, diarrhea, fluid overload)
- Nutrition
- Pain management
- GVHD assessment
- Education

BMT Clinical Social Worker

- Core members of the BMT team
- Complete pre-transplant psychosocial evaluation, high risk screening for psychosocial factors that may negatively impact transplant outcomes
- Establish a therapeutic relationship and engage in problem solving and planning to develop caregiver and relocation plans
- Experts in providing psychosocial care
- Facilitate family meetings and bridge communication with the care team
- Contribute to optimizing patient outcomes and quality of life
No effective therapies ➔ Chemotherapy era ➔ Stem Cell Transplant era (Combinations of chemotherapy, immunotherapy) ➔ Targeted agents, better stem cell transplants and more broadly effective immunotherapies

1825 First description of acute leukemia

1960s Combination chemotherapy + stem cell transplants

1990s T cells critical for transplant cures—dramatic increase in success

2017 Approval of engineered T cell therapies

Resources

- LLS – The Leukemia & Lymphoma Society [www.LLS.org](http://www.LLS.org)
- FACT – Foundation for the Accreditation of Cellular Therapy (FACT) [www.factwebsite.org](http://www.factwebsite.org)
- ASTCT – American Society of Transplant and Cellular Therapy [www.astct.org](http://www.astct.org)
- CIBMTR – Center for International Blood & Marrow Transplant Research (CIBMTR) [www.cibmtr.org](http://www.cibmtr.org)
- ASH – American Society of Hematology [www.hematology.org](http://www.hematology.org)
- National Marrow Donor Program (NMDP) [www.bethematch.org](http://www.bethematch.org)
- Or…transplant professionals near or far!
FREE LLS RESOURCES FOR HEALTHCARE PROVIDERS

- CME & CE courses: www.LLS.org/CE
- Fact Sheets for HCPs: www.LLS.org/HCPbooklets
- Videos for HCPs: www.LLS.org/HCPvideos
- Podcast series for HCPs: www.LLS.org/HCPpodcast

FREE LLS RESOURCES FOR PATIENTS

- **Information Specialists** – Personalized assistance for managing treatment decisions, side effects, and dealing with financial and psychosocial challenges (IRC).

- **Clinical Trial Nurse Navigators** – RNs provide a personalized service for patients seeking treatment in a clinical trial, sift through the information and provide information to bring back to their HC team (CTSC).
  - www.LLS.org/CTSC

- **Registered Dieticians** – (LLS) provides PearlPoint Nutrition Services® to patients/caregivers of all cancer types, free nutrition education and one-on-one consultations by phone or email.
  - www.LLS.org/nutrition

- **Reach out** Monday–Friday, 9 am to 9 pm ET
  - Phone: (800) 955-4572
  - Live chat: www.LLS.org/IRC
  - Email: infocenter@LLS.org
  - HCP Patient Referral Form: www.LLS.org/HCPreferral
FREE LLS RESOURCES FOR PATIENTS

- Webcasts, Videos, Podcasts, booklets:
  - www.LLS.org/Webcasts
  - www.LLS.org/EducationVideos
  - www.LLS.org/Podcast
  - www.LLS.org/Booklets

- www.Lls.org/treatment/types-treatment/stem-cell-transplantation

- Support Resources
  - Financial Assistance: www.LLS.org/Finances
    - Urgent Need
    - Patient Aid
    - Travel Assistance
  - Other Support: www.LLS.org/Support
    - LLS Regions
    - Online Weekly Chats Facilitated by Oncology SW
    - LLS Community Social Media Platform
    - First Connection Peer to Peer Program

FREE LLS RESOURCES FOR YOUR PATIENTS

BOOKLETS AND FACT SHEETS

English – www.LLS.org/Booklets
Spanish – www.LLS.org/Materials
Questions?

Ask a question by web:
– Click “Ask a question”
– Type your question
– Click “Submit”

CLOSING

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THANK YOU