BMT survivors are at significant risk for late complications, including organ toxicity, graft-versus-host disease, infections, secondary cancers, and psychosocial distress. Because community-based nurses frequently provide long-term follow-up care for these patients, it’s essential that they have a solid primer in their needs. This session will introduce you to the BMT process, covering assessment, potential late complications, common post-transplant medications, and the survivorship and education needs of this patient population. Case studies will illustrate the 2012 expert care guidelines. You’ll also receive a free education tool that will help you coordinate appropriate, timely patient care.

**Content Area:** Clinical Practice

**Content Level:** Intermediate

**Speaker:**
Joyce Neumann, MSN, AOCN®, RN
MD Anderson Cancer Center
Houston, TX
jneumann@mdanderson.org

**Full Disclosure:**
Nothing to Disclose

**Speaker:**
Elaine Stenstrup, MSN, ACNS-BC, AOCNS®
University of Minnesota Medical Center
Minneapolis, MN
estenst2@fairview.org

**Full Disclosure:**
Intends to discuss unapproved/investigational use of a commercial product/device during this educational activity

**Objectives:**
At the end of this session, participants will be able to:
1. Plan appropriate nursing assessments and interventions based on the 2012 published guidelines for follow-up care of transplant recipients.
2. Identify resources for patient education and ongoing nursing education.

**Content Outline:**
1. Overview of late complications of autologous and allogeneic BMT
   A. Organ toxicity
   B. Graft versus host disease
   C. Infections

D. Secondary cancers
E. Growth and development (including sexual and fertility)
F. Psychosocial and quality of life (QOL)
   1. Adult and pediatric

II. Nursing assessments and care for BMT survivors
A. Ocular and oral
B. Cardiopulmonary
C. Renal and hepatic
D. Muscular skeletal
E. Neurological and endocrine
F. Energy and sleep quality
G. Sexuality and psychosocial
H. Health maintenance
   I. Lifestyle (diet, travel, pets and plants, returning to work/school)
J. Immunology

III. Common post-transplant medications
IV. Caregiver assessments
V. Transitioning to long-term follow-up care and adult care (pediatric)
VI. Resources for nurses and patients
   A. NMDP “Be The Match” post-transplant care guides
   B. NMDP Advances in Transplantation newsletter
   C. ONS BMSCT SIG
   D. ONS Infections/BMT PEP cards

VII. Case Studies (incorporate this into assessments and care)
   A. Autologous
   B. Allogeneic (highlight GVHD)
   C. Pediatric autologous or allogeneic

**Bibliography:**


Objectives

- Describe the BMT process
- Briefly discuss current stats related to BMT
- Explain unique late effects issues in transplant patients that may impact their quality of life.
- Discuss the unique challenges of caring for patients with chronic graft versus host disease.
- Describe support materials that will assist transplant patients deal with through continuum.

Indications for BMT

**Adult and Pediatrics**
- Leukemia
- Lymphoma
- Aplastic Anemia
- MDS
- Sickle Cell Disease

**Adult only**
- Multiple Myeloma
- Myelofibrosis

**Pediatrics only**
- Metabolic Diseases
- Genetic Diseases
- Primary Immunodeficiency Diseases

Hematopoietic Cell Transplantation (HCT)

- Targeted chemo-radio therapy
- Antigen specific genetically mod.

Effects of Treatment

- Preparative (conditioning) regimen
  - severity of side effects and complications dependent on the degree of:
    - Myelosuppression (chemo/TBI)
    - Immunosuppression including Cyclosporine (CSA)
    - Organ toxicity

Providing Cutting Edge, Best Patient Care

- Treatment is rapidly advancing to incorporate new advances in:
  - Chemotherapy
  - Radiation therapy
  - Immunotherapy & immunomodulatory drugs
  - Genetic & cellular therapies
- All these treatments come together in HCT.

Trends

- Survival is improving and patients are experiencing better quality of life (QOL) during treatment, early recovery and long term.
  - Expanding pool of stem cell sources
  - More effective, less toxic regimens
  - New supportive care drugs
  - Maintenance therapy
Recent Trends

- Higher probability of long-term survival in patients in remission 2-5 years after HCT
- Life expectancy lags behind gender and age matched peers for 15-20 years after HCT
- Disease recurrence, chronic Graft-versus-host Disease (GVHD), organ failure and secondary cancer common causes of late death
- Chronic GVHD (cGVHD) in an important factor associated with late mortality in allogeic HCT recipients.

Majhail & Rizzo, 2013

Overall Survival (OS)

- Over 3,700 2 year disease free survivors after myeloablative allogeneic SCT – probability of OS at 10 years for ALL (80%), AML (84%), lymphoma (84%), MDS (80%), SAA (92%)
- Cumulative incidences of non-relapse mortality at 10 years ranged 9 – 12%
- Remission at 2 years, recurrent disease most common (41%) cause of death esp. high 2-5 years post HCT, other cGVHD, infections, organ failure and secondary cancer
- Older age and cGVHD : major factors of overall and non-relapse mortality.

Wingard et al., 2011
Reported by Center for International Blood and Marrow Transplantation (CIBMTR)
Late Effects and cGVHD

Late effects and cGVHD both:
- have physical & psychosocial elements
- can last many years
- require coordination of care
- require symptom recognition/treatment

Ophthalmologic & Oral

**Ophthalmologic**
- Dry eyes
- Cataract
- Retinopathy
- Follow-up

**Oral**
- Sicca syndrome
- Infectious
  - Viral, Fungal, Bacterial
- Dental caries
- Tooth development in pediatric survivors
- Taste alterations

Cardiovascular

- Cardiomyopathy
- Cardiovascular disease
- Risk ↑ with cardiotoxic chemo, local xrt, cardiovascular risk factors
- Follow-up
  - Screening, heart healthy lifestyle, early treatment of risk factors (diabetes, hypertension)

Pulmonary

- Bronchiolitis obliterans increase cGVHD
- Obstructive
- Restrictive
- Diffusion disorders
- Follow-up
  - smoking cessation, PFT

Hepatic & Renal

- Hepatitis B/C
- Iron overload
- Chronic kidney disease
- Follow-up
  - Evaluate renal function
  - Treatment of hypertension

Muscular & Joints

- Atrophy
- Pain
- Joint contractures
- Myopathy
- Follow-up
  - Stretching exercise
  - PT consult

Epstein et al., 2002; Hottla et al., 2005; Hymes et al., 2012; Leite et al., 2006

Baker et al., 2010; Tichelli et al., 2007; Tichelli et al., 2008

Laffan & Biedrzycki, 2006; Tierney & Robinson, 2013

Hingorani et al., 2006; Kendig et al., 2007; Majhail et al., 2012

Tierney & Robinson, 2013
Second Cancers & Relapse

- Screening
- Solid tumors
- Risk factors for second cancers:
  - TBI, cGVHD, and prolonged immunosuppression
- Follow-up:
  - Recommendations for screening, earlier age for screening mammography then general population, skin & oral screening extremely important, sun protection, smoking cessation
- Risk factors for Relapse
  - Immunosuppression
  - Refractory disease
  - Conditioning regimen

Hematologic

- Secondary malignancy
  - MDS, Acute myeloid leukemia
  - alkylating agents and topoisomerase II inhibitors, TBI, 2-5 years post auto SCT
  - B cell (post-transplant) lymphoproliferative disorder (PTLD)
    - T cell depletion, ATG, unrelated mismatched donor
- Iron overload
  - Impact liver, heart, kidney, lung
  - Increased risk of opportunistic infection (ferritin, iron, and TIBC)

Neurological

- Signs and Symptoms
- At risk
  - All HCT auto/allo
  - Especially pediatric HCT patients
- Follow-up
  - Assess for complications, cognitive development

Endocrine

- Growth and development (pediatric)
- Sexual development and functioning
- Thyroid disease: hypothyroidism
- Diabetes
- Bone mineral changes
  - Bone density tests, Vit D and calcium supplements, physical activity
  - Osteopenia, osteoporosis
  - Avascular necrosis (steroid use)
  - Pathologic fracture

Bone Health

- Check a vitamin D 25,OH level
- Bone mineral density study
- Consider calcium and vitamin D supplementation.
  - Post menopausal, androgen suppressed, thyroid suppressed, men 70 and older
- See clinical practice algorithms

Genitourinary

- Erectile dysfunction
- Vaginal dryness, vaginal stenosis (narrowing)
- Hemorrhagic cystitis
  - infection BK virus usually with acute
- Infertility: all types of HCT
- Follow-up
  - assess, vaginal moisturizer & dilator, referral
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<thead>
<tr>
<th>Integumentary</th>
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<tbody>
<tr>
<td>• Hair changes</td>
<td>• Fatigue</td>
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<tr>
<td>• Nail growth pattern changes</td>
<td>• Sleep disorders</td>
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<td>• Follow up care</td>
<td>• Body image disturbance</td>
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<td>– Routine self exams</td>
<td>• Anxiety disorders, depression</td>
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<tr>
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<td>– Positive changes in quality of life – new appreciation for life</td>
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<td>• Fertility concerns before treatment and after recovery</td>
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<td>– <a href="http://www.sunguardsunprotection.com">www.sunguardsunprotection.com</a></td>
<td>• Sexual function</td>
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<td>• Sun exposure before 11 am or after 4 pm</td>
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<thead>
<tr>
<th>Adolescent / Young Adult (AYA)</th>
<th>Chronic GVHD (cGVHD)</th>
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<tr>
<td>• Transition from Pediatric BMT provider to primary pediatrician</td>
<td>• Multisystem, autoimmune-like disorder post-transplant</td>
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<tr>
<td>– Care coordination is key</td>
<td>• Day 100 historically mark acute vs. chronic</td>
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<tr>
<td>• Transition from pediatrician to adult provider</td>
<td>• Type of onset</td>
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<td>– Challenges and barriers:</td>
<td>• Quiescent: cGVHD occurs after previous aGVHD resolved</td>
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<tr>
<td>• Fear of leaving provider who has history with patient</td>
<td>• Progressive: aGVHD merges into cGVHD</td>
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<td>• Fear adult provider does not have knowledge of pediatric disease/signs of recurrence</td>
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<td>• Challenges and barriers:</td>
<td>• DeNovo: cGVHD develops without any preceding aGVHD</td>
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<td>• Transition from pediatrician to adult provider</td>
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<td>• Follow up – screening</td>
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<td>• Moving toward independence</td>
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<td>• Challenges and barriers specific to AYA</td>
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National Cancer Policy Forum, 2014

Barriers to Management of Late Effects

• Transplant center & community provider
• Lack of communication, awareness, tools, and resources; Competing priorities
• Patient
• Lack of awareness of risk, guidelines, socio-economic resources
• Healthcare system
• Lack of resources, specialist, reimbursement, prospective, randomized clinical trials

National Cancer Policy Forum, 2014

Chronic GVHD (cGVHD)

• Multisystem, autoimmune-like disorder post-transplant
• Day 100 historically mark acute vs. chronic
• Type of onset
  • Quiescent: cGVHD occurs after previous aGVHD resolved
  • Progressive: aGVHD merges into cGVHD
  • DeNovo: cGVHD develops without any preceding aGVHD

Bishop & Wingard, 2004; Lee et al., 2003; Kydd & Rowett, 2006
cGVHD

- cGVHD occurs in 15-80% of recipients of an allogeneic transplant depending on cell source and host factors.
- The sequel and sometimes irreversible organ manifestations of cGVHD significantly impacts QOL.
- cGVHD is leading cause of late-term non-relapse mortality (NRM).
- Do not delay systemic therapy when indicated. Starting dose of steroids is 1mg/kg.
- Refer to GVHD Clinic, if available
  - Supportive Care Measures TO IMPROVE QOL
  - Baseline ASSESSMENT of Severity
  - ASSESSMENT for trial
  - ASSESSMENT for secondary or steroid-sparing treatments.

**cGVHD – Diagnosis**

- Biopsy
  - Skin, liver, mouth, vaginal, GI, lung
- Diagnosis by exclusion
- PFT
- For eyes
  - Schirmer test and slit lamp examination

**cGVHD – Assessment**

- Blood and marrow Transplant Clinical Trials Network (BMT CTN)
  - **Joint & Fascia**: mild (no impact on ADL) to contracture with significant impacting on ADL
  - **Genital**: mild signs on exam, report no effect on sexual activity to advanced signs strictures and severe pain
  - **Lung**: mild (SOB with 1 flight of stairs) to severe (SOB at rest needing oxygen) – lung transplantation

**cGVHD – Assessment (cont’d)**

- **Skin Score**: Body surface area, sclerotic features, hidebound, impaired mobility, ulceration or severe pruritus
- **GI**: symptoms dysphagia, anorexia, nausea or vomiting, pain, diarrhea without wt. loss <5% to >15% wt. loss
- **Mouth**: mild not limiting oral intake to major limitation of oral intake
- **Eye**: mild (drops 3 times per day) to severe dryness with severe limiting ADL or keratoconjunctivitis sicca

Hymes et al., 2012

**cGVHD – Assessment (cont’d)**

- **BMT CTN**
  - Rate on 1-4 scale and 0-10 scale
  - Erythematous rash present?
  - Nausea, vomiting, or diarrhea?
  - Liver: normal LFT to Bilirubin, AST or ALT > 5 times
  - PFT: FEV1, DLIcO2 (0-3)
Complications of treatment

- Drugs used to treat GVHD and the myriad of adverse effects
  - Infectious complications
  - Microvascular damage
  - Renal
  - Steroid myopathy
- Site/extent of GVHD

Treatment of cGVHD

- Nursing implications
  - Administer oral/IV medication
  - Perform procedure commensurate with training (ECP-extracorporeal photopheresis)
  - Provide skin/dressing care
  - TEACH patient and family
  - Coordinate care and resource (SW, PT, OT, wound care) for patient and family
  - Evaluate effectiveness of treatment report and document

(Acute &) Chronic Skin GVHD

- Assessment
  - History and Physical
  - Skin and ocular assessment
- Diagnosis
  - Skin Biopsy (3-4mm punch biopsy)
  - Pathology report (suggestive of, consistent with, grade I/II, grade III/IV)
- Interventions
  - Physical therapy consult
  - Endocrine consult – diabetic nursing educator
  - Topical management

(Acute &) Chronic Skin GVHD

- Systemic Therapy
  - Clinical Trial whenever possible contact GVHD team
  - First-line therapy:
    - Acute: Prednisone 2 mg/kg/day PO as two divided doses or methylprednisolone equivalent PO (based on IBW)
    - Chronic: 1mg/kg/day once per day or divided dose
  - Suggested second-line therapy to get off steroid if refractory or reflare with taper:
    - Trial When Available
    - MMF, ECP (or PUVA), Pentostatin (acute), Rituximab, (or ATG acute)

Chronic Ocular GVHD

- Artificial tears prn at bedside
- Dry skin around eyes: cleanse with NS, may use NS soaks
- Apply Lacri-lube (moisturizing eye ointment) at night and BID to area around eye

Implications for Practice

Survivorship care encompasses the continuum of treatment, recovery and beyond.

Nurses in non-HCT or community settings are presented with unique challenges as more HCT survivors transition from the HCT team to enter the community.
Unique challenges for non-HCT nurse

- Knowledge of HCT procedure
- Knowledge of HCT program/contacts
- Symptom recognition and treatment
- AYA has extra challenges
- Resources

Care Coordination of HCT survivors

- Nurse or care coordinators/navigators are a great source for information
  - Professional framework from which they function
  - Patient + organization is core
- Care coordinators are link to primary provider
  - Provides patient’s story
- Ensure patient/caregiver knowledge
- Provide resources to patient/caregiver, staff

Resources for Nurses & Patients

- Oncology Nursing Society
  - www.ons.org
  - BMT SIG
    - Connect with experts
    - PEP cards
    - Prevention of Infections: Transplant

Resources for Nurses & Patients

- National Marrow Donor Program /Be The Match
  - bethematchclinical.org
  - Post Transplant Care Guidelines
    - 6, 12 and 24 month post-BMT follow up guidelines in print & electronic format
  - Advances e-newsletter
    - Stay up to date on current research

Resources for Nurses & Patients

- www.bmtinfonet.org
- BeTheMatch.org
- www.cancer.org
- www.cancer.gov
- Cibmtr.org
- www.cancercare.org
- www.fertilehope.org
- www.lls.org
- www.nbmtlink.org
- www.oncofertility.northwestern.edu/
- wwwresolve.org
- wwwresolve.org
- www.supersibs.org
- www.stupidcancer.com
- www.planetcancer.org
- www.vitaloptions.org
- www.youngsurvival.org