NCCN Guidelines® Insights

Adolescent and Young Adult Oncology, Version 2.2014

Featured Updates to the NCCN Guidelines

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Abstract

The NCCN Guidelines Insights on Adolescent and Young Adult (AYA) Oncology discuss the fertility and endocrine issues that are relevant to the management of AYA patients with cancer. Fertility preservation should be an essential part in the treatment of AYA patients with cancer. The NCCN Guidelines recommend discussion of fertility preservation and contraception before the start of treatment. Oophoropexy and embryo cryopreservation are the 2 established options for fertility preservation in women. Semen cryopreservation before the start of treatment is the most reliable and well-established method of preserving fertility in men. AYA women with cancer also have unique contraception needs, depending on the type of cancer, its treatment, and treatment-related complications. Management of cancer during pregnancy poses significant diagnostic and therapeutic challenges for both the patient and the physician. AYA women diagnosed with cancer during pregnancy require individualized treatment from a multidisciplinary team involving medical, surgical, radiation, and gynecologic oncologists; obstetricians; and perinatologists. (*J Natl Compr Canc Netw* 2014;12:21–32)

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Individual disclosures of potential conflicts of interest for the NCCN Adolescent and Young Adult Oncology Panel members can be found on page 22.

Please Note

The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) are a statement of consensus of the authors regarding their views of currently accepted approaches to treatment. **The NCCN Guidelines® Insights highlight important changes in the NCCN Guidelines® recommendations from previous versions. Colored markings in the algorithm show changes and the discussion aims to further understanding of these changes by summarizing salient portions of the panel's discussion, including the literature reviewed.**

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Learning Objectives:

Upon completion of this activity, participants will be able to:

- Integrate into professional practice the updates to NCCN Guidelines for Adolescent and Young Adult Oncology
- Describe the rationale behind the decision-making process for developing the NCCN Guidelines for Adolescent and Young Adult Oncology

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DEFINITION OF THE ADOLESCENT AND YOUNG ADULT ONCOLOGY POPULATION

The National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) database defines the Adolescent and Young Adult (AYA) Oncology patient as the one diagnosed at 15-29 years of age.[a] Subsequently, NCI's AYA Oncology Progress Review Group defines AYA as a patient diagnosed at 15-39 years of age.[b] In the NCCN Guidelines, AYA will be defined as patients 15-39 years of age at the time of initial cancer diagnosis.

PURPOSE OF THE NCCN GUIDELINES FOR AYA ONCOLOGY

- **These guidelines have been developed as supportive care guidelines and not as treatment guidelines. The purpose of the guidelines is to increase awareness of unique issues in AYA oncology, identify issues, and recommend interventions unique to the AYA population. In addition, these guidelines will identify resources available to the AYA population, include appropriate tabular materials, and make recommendations per patient management.**
- **AYA patients diagnosed with cancer should be recognized as distinct age groups that have unique medical and psychosocial needs. The frequency of distribution of cancer types is dramatically different across the age spectrum of the AYA population.[c]**
- **The distinct biology of disease as well as other age-related issues in the AYA population (fertility, long-term side effects, insurance/financial issues, transportation to clinic appointments, child care, psychosocial support, and adherence to therapy) should be considered in the treatment decision-making process.**
- **The goal of the NCCN Guidelines for AYA Oncology is to identify issues specific to the AYA population; recommend interventions unique to the AYA population; educate physicians regarding the prevalence of cancer in AYAs; discuss long-term consequences; explain special considerations related to cancer management in AYA patients that aim to improve treatment tolerance, compliance, and clinical outcomes; and promote participation in clinical trials.**
- **Participation in clinical trials should be strongly encouraged in the AYA population.**

[a] Bleyer A, O'Leary M, Barr R, Ries L. Cancer Epidemiology in Older Adolescents and Young Adults 15 to 29 Years of Age, Including SEER Incidence and Survival: 1975-2000. National Cancer Institute, NIH Pub. No. 06-5767 2006.
[b] Closing the Gap: Research and Care Imperatives for Adolescents and Young Adults with Cancer Report of the Adolescent and Young Adult Oncology Progress Review Group. 2006. http://planning.cancer.gov/library/AYAO_PRG_Report_2006_FINAL.pdf
[c] For age-specific incidences rates of cancer by age group and sex in the AYA population, See Table 2 (MS-23).

AYAO-1

NCCN Categories of Evidence and Consensus

Category 1: Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2A: Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2B: Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.
Category 3: Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise noted.

Clinical trials: NCCN believes that the best management for any cancer patient is in a clinical trial. Participation in clinical trials is especially encouraged.

Overview

Adolescent and young adult (AYA) patients are generally defined as individuals 15 to 39 years of age at the time of initial cancer diagnosis.[1] Nearly 70,000 people in this age group are diagnosed with cancer each year in the United States, which is 7 times more than those diagnosed who are younger than 15 years of age. The biology, epidemiology, and clinical outcomes of AYA patients with cancer are usually different from those of younger and older patients with cancer.[2] The distinct biology of the disease and developmental issues specific to the AYA population (eg, fertility; family planning; pregnancy; education; career development; employment; sexually transmitted diseases; tobacco, alcohol, and substance abuse) should be considered in the treatment decision-making process (see AYAO-1, above).[3] Quality care for AYA patients with cancer is tied to timely detection and initiation of treatment, compliance with and adherence to treatment, and access to a multidisciplinary team of health care

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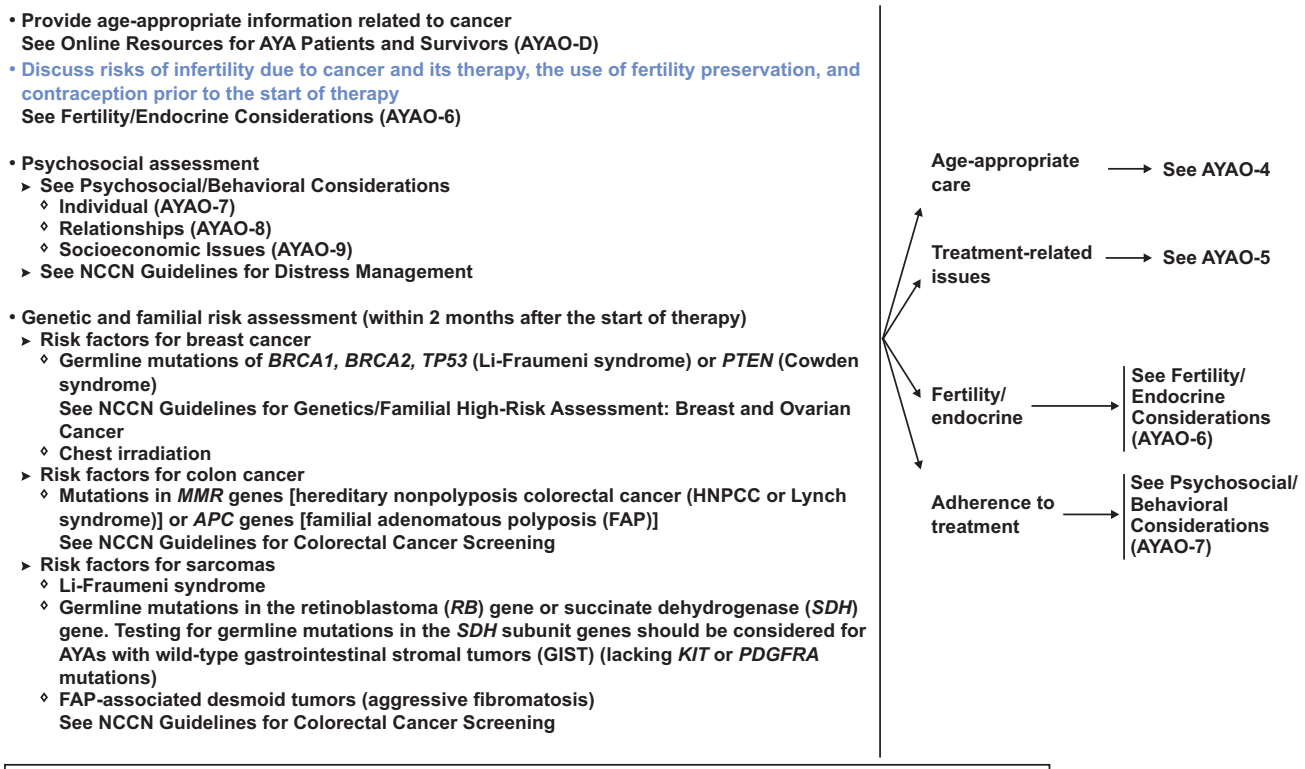

AYAO-3

professionals well versed in the specific developmental issues relevant to this patient population.[4,5]

These NCCN Guidelines Insights discuss fertility and endocrine issues that are relevant to the management of AYA patients with cancer. For other articles that discuss AYA oncology, including non-fertility–related issues, see Table 1.

Impact of Cancer and Its Treatment on Fertility

Infertility is a major consequence of cancer and its treatment in both men and women.[6,7] The impact of cancer treatment on fertility is related to patient age at the time of diagnosis and the treatment, and is dependent on the type, duration, and dose intensity of treatment. Alkylating agent–based chemotherapy, high-dose cranial radiation therapy (RT) that can impair hypothalamic pituitary function, and targeted RT to the ovaries and testes are primary risk factors for gonadal dysfunction and decreased fertility in both men and women.[8–12] Gonadal exposure to low doses of RT can result in oligospermia or azoospermia in men. Higher doses of RT are associated with both ovarian and uterine dysfunction in women.

Young women with Hodgkin lymphoma (HL) treated with chemotherapy are at a risk of developing premature ovarian failure, irrespective of their age at the time of treatment (38% for those diagnosed between 30 and 40 years of age; 37% for those diagnosed between 9 and 29 years of age), and the cumulative risks for premature ovarian failure are much higher after alkylating agent–based chemotherapy.[13,14] In a large cohort of women treated between the ages of 15 and 40 years for HL, the cumulative risk of premature ovarian failure after alkylating agent–based chemotherapy was 60% compared with only 3% to 6% after non–alkylating agent–based chemotherapy.[14] Independent risk factors for acute ovarian failure include increasing doses of ovarian irradiation and

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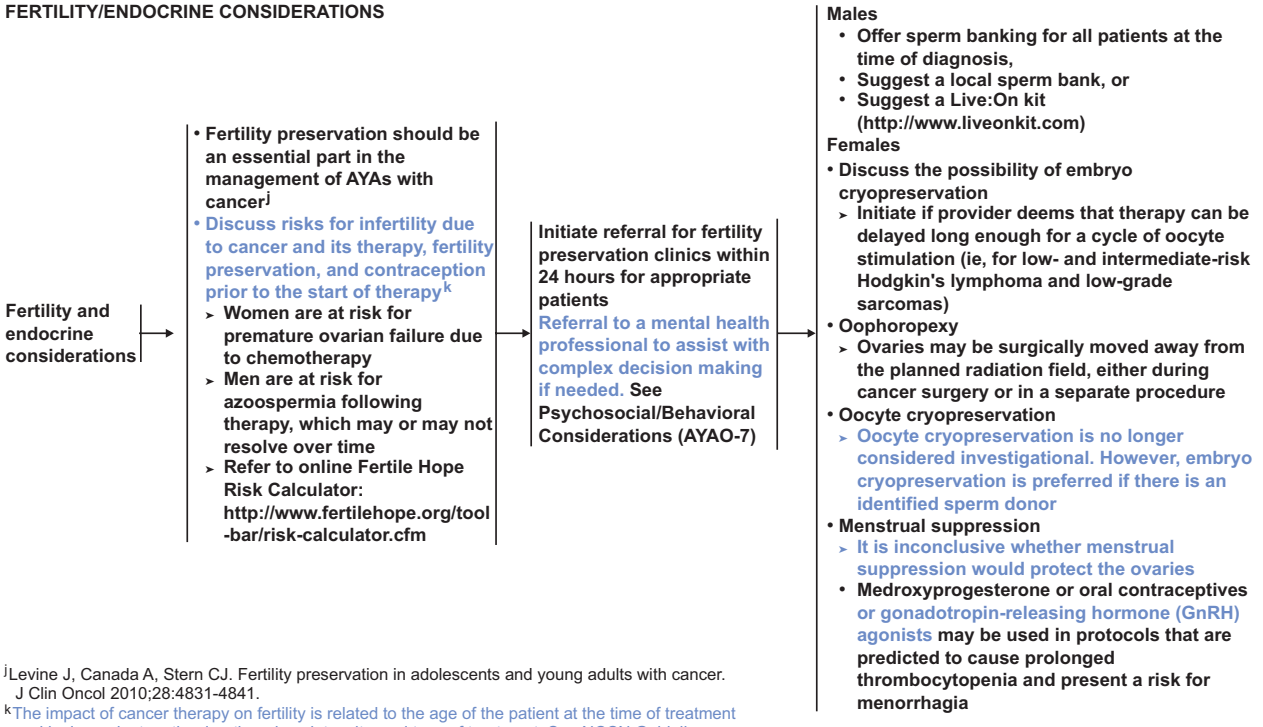

[j]Levine J, Canada A, Stern CJ. Fertility preservation in adolescents and young adults with cancer. J Clin Oncol 2010;28:4831-4841.

[k]The impact of cancer therapy on fertility is related to the age of the patient at the time of treatment and is dependent on the duration, dose intensity, and type of treatment. See NCCN Guidelines for Breast Cancer for the management of women with breast cancer during pregnancy.

AYAO-6

exposure to procarbazine and cyclophosphamide between ages 13 and 20 years.[9]

Among young women treated with adjuvant chemotherapy for breast cancer, the risk for premature menopause is significantly higher for women older than 35 years with newly diagnosed breast cancer treated with chemotherapy.[15,16] Similarly, among female survivors of HL diagnosed between 14 and 40 years of age, women who were 22 to 39 years of age at first treatment were at a higher risk for developing premature menopause after treatment compared with younger patients (14–21 years).[17] Treatment with MOPP (mechlorethamine, vincristine, procarbazine, and prednisone)/ABV (doxorubicin, bleomycin, and vinblastine) significantly increased the risk of ovarian failure. After 10 years of treatment, the actuarial risk of premature menopause was 64% after high cumulative doses (>8.4 g/m^2) and 15% after low doses (≤4.2 g/m^2) of procarbazine.[17]

In men treated with alkylating agent–based chemotherapy and RT to the testes, germ cell dysfunction with resultant infertility is more common than Leydig cell dysfunction and testosterone insufficiency.[18] Leydig cell dysfunction is characterized by increased plasma concentrations of luteinizing hormone combined with low levels of testosterone. Germ cell dysfunction is associated with reduced testicular volume, increased follicular stimulating hormone concentrations, and reduced plasma concentrations of inhibin B. Leydig cell dysfunction occurs at RT doses higher than those associated with germ cell dysfunction. AYA men treated with a testicular radiation dose of 20 Gy or greater are at high risk for Leydig cell dysfunction, whereas testicular radiation doses of 2 Gy or greater can impair spermatogenesis resulting in permanent azoospermia.[18] Total body irradiation (TBI) used as part of high-dose conditioning before hematopoietic stem cell transplant can also affect the testis, resulting in permanent infertility in most AYA men.[19]

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DISEASE-SPECIFIC ISSUES RELATED TO AGE

Acute lymphoblastic leukemia (ALL)
- See NCCN Guidelines for ALL

Bone and Soft tissue sarcomas
- See NCCN Guidelines for Bone Cancer and NCCN Guidelines for Soft Tissue Sarcoma
- Rhabdomyosarcoma
  - Uncommon outside of the pediatric population; should be referred to an institution with experience in the management of rhabdomyosarcoma

Colon cancer
- Higher incidence of mucinous histology
- More often right-sided
- Higher incidence of signet ring cells and microsatellite instability (MSI)
- More advanced stage at diagnosis
- Lower incidence of *KRAS* mutations
- Decreased incidence of chromosomal instability
- Consider mismatch repair gene deficiency in these patients
- Increased risk for additional malignancies

Melanoma
- Melanocytic tumors of uncertain malignant potential (MELTUMP) are more frequently seen in younger patients and when suspected, referral to a pathologist with expertise in atypical melanocytic lesions is recommended.
- Principles of pathology for younger patients with consideration to additional testing comparative genomic hybridization (CGH) or fluorescence in situ hybridization (FISH) may be useful to detect the presence of selected gene mutations for histologically equivocal lesions. See NCCN Guidelines for Melanoma.
- Sentinel lymph node biopsy
  - Higher yield in AYA population
- Surgical margins have not been established for patients <18 years of age, as they were not included in the trials.

Management of Cancer During Pregnancy
- AYA women diagnosed with cancer during pregnancy should be managed by a multidisciplinary team involving medical, surgical and radiation oncologists, gynecologic oncologists, obstetricians and perinatologists.
- Selection of an appropriate treatment plan is dependent on individual tumor biology, tumor stage and most importantly the gestational stage of the fetus.
- Referral to tertiary cancer centers with expertise in maternal-fetal medicine and knowledge of the physiological changes that occur during pregnancy should be strongly encouraged.
- Chemotherapy should be avoided during the first trimester because of greater risk of teratogenic effects and intrauterine fetal death.
- RT is contraindicated during pregnancy. In very rare instances when RT is necessary, should be delivered in low therapeutic doses with adequate uterine shielding to minimize fetal exposure.

AYAO-A

Azoospermia is more common among men treated with chemotherapy for HL and testicular cancer.[20,21] Azoospermia has been reported in more than 90% of men receiving procarbazine-based chemotherapy regimens and may not resolve over time, resulting in permanent infertility.[21] Alternatively, the ABVD (doxorubicin, bleomycin, vinblastine, and dacarbazine) regimen has been shown to be less gonadotoxic, with most patients regaining normal fertility after completion of treatment.[20] Cisplatin-based chemotherapy for testicular cancer is associated with temporary azoospermia in most men, with a recovery of spermatogenesis in approximately 50% to 80% of patients after 2 to 5 years.[20] RT greater than 2 Gy delivered to testes, moderate- to high-dose alkylating agent chemotherapy (MOPP >3 cycles) or higher cumulative alkylating agent dose (busulfan ≥600 mg/m^2, cyclophosphamide >7.5 g/m^2 or ifosfamide ≥60 g/m^2), or any alkylating agent combined with RT to testes or TBI are considered risk factors for oligospermia and azoospermia.[6] Pelvic RT and cumulative cyclophosphamide doses greater than 9.5 g/m^2 are associated with a high risk of permanent infertility in men with non-Hodgkin's lymphoma, Ewing sarcoma, and soft tissue sarcoma.[22,23] Retroperitoneal lymph node dissection is also associated with infertility in men with testicular cancer.[24]

The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) for AYA Oncology recommend discussing the risks of infertility associated with cancer and its treatment with all patients at the time of diagnosis, before initiating treatment (see AYAO-3, page 24). To determine the risk of infertility in AYA patients according to the type and treatment of their cancer, the NCCN Guidelines recommend referring to the online risk calculator developed by Fertile Hope (based on a

compilation of clinical experience and published research on common cancer treatments that may impact reproductive function in both men and women), which provides information about the risk of developing infertility (http://www.fertilehope.org/tool-bar/risk-calculator.cfm).

Fertility Preservation

Fertility preservation is an issue of crucial importance in AYA patients with cancer and should be an essential part in the management of their cancer.[19,25,26] However, it is currently one of the most underprescribed and least implemented services in AYA patients with cancer.[19,25,27] The ASCO guidelines recommend that providers discuss the options for fertility preservation with all new patients with cancer at the time of diagnosis.[28] Psychosocial providers can assist patients and families in the decision-making process about fertility preservation, particularly when AYA patients are distressed about the potential infertility associated with cancer treatment.[28]

Options for Women

Oophoropexy and embryo cryopreservation after in vitro fertilization (IVF) are the 2 established options for fertility preservation in women.[28] Mature oocyte cryopreservation and ovarian tissue grafting and freezing are emerging techniques for fertility preservation in young women. Ideally, fertility preservation should be initiated before the start of treatment. However, in some situations, when it is impractical or impossible to pursue fertility preservation before initiating therapy, readdressing the issue later in course of treatment may be appropriate.

Oophoropexy involves surgically displacing the ovaries out of the RT field to minimize ovarian damage and has been shown to preserve ovarian function.[29] Embryo cryopreservation after IVF has been highly successful in women younger than 40 years.[19,25] However, this method requires a male partner or sperm donor who is available with short notice.

Mature oocyte cryopreservation is a potential alternative for single women but, like embryo cryopreservation, requires hormone stimulation.[19,25] Evidence from randomized trials[30–33] and a recent meta-analysis[34] suggests that IVF with cryopreserved oocytes results in fertilization and pregnancy rates similar to those for fresh oocytes. Oocyte cryopreservation is no longer considered experimental in the recently published guidelines from the American Society for Reproductive Medicine[35]; however, these guidelines also acknowledge that more data are needed to recommend the routine use of oocyte cryopreservation in place of embryo cryopreservation.

Ovarian tissue grafting does not require hormonal stimulation, and therefore no long delay in treatment is necessary.[19] However, this procedure would not be appropriate for some women with cancer, because reintroduction of malignant cells could occur with grafting. Ovarian tissue grafting is still considered investigational.

Randomized trials that have evaluated the role of menstrual suppression with gonadotropin-releasing hormone (GnRH) agonists to preserve ovarian function during chemotherapy have provided conflicting reports. Three randomized trials showed that the use GnRH agonists with chemotherapy may preserve ovarian function in young female patients with breast cancer and HL.[36–38] Other studies have reported that these agents do not protect the ovaries in female patients receiving chemotherapy for breast cancer and HL.[39–42]

Options for Men

Semen cryopreservation before the start of treatment is the most reliable and well-established method of

Table 1 AYA Oncology Articles Published in *JNCCN*

- Bleyer A. How NCCN Guidelines can help young adults and older adolescents with cancer and the professionals who care for them. 2012;10:1065–1071.
- Coccia PF. Don't give up—they eventually grow up: issues in AYA medicine. 2012;10:1059–1060.
- Zebrack B, et al. Context for understanding psychosocial outcomes and behavior among adolescents and young adults with cancer. 2012;10:1151–1156.
- Hubbard JM, et al. Adolescent and young adult colorectal cancer. 2013;11:1219–1225.
- Johnson RH, et al. Optimizing fertility preservation practices for adolescent and young adult cancer patients. 2013;11:71–77.
- Reed D, et al. Controversies in the evaluation and management of atypical melanocytic proliferations in children, adolescents, and young adults. 2013;11:679–686.
- Tichy JR, et al. Breast cancer in adolescents and young adults: a review with a focus on biology. 2013;11:1060–1069.

preserving fertility in AYA men with cancer.[19,25] The success of sperm banking may be limited in some patients, such as those with HL and testicular cancer, who may already have azoospermia associated with the disease. Depending on the type of chemotherapy, semen collection may be possible after initiation of chemotherapy; however, the impact of chemotherapy and RT on the risk of genetic defects in the offspring remains unknown.[43]

Cryopreservation and subsequent transplantation of spermatogonial stem cells is experimental but may be an alternative option for some patients in whom semen cryopreservation is not possible.[19,25] Limited evidence exists regarding the efficacy of hormone suppression in reducing the risk of male infertility during chemotherapy.[28]

Recommendations for Fertility Preservation

The NCCN Guidelines emphasize that fertility preservation should be an essential component in the management of AYA patients with cancer (see AYAO-6, page 25). Options for fertility preservation should be discussed with all patients before the start of treatment, and providers should initiate referral to fertility preservation clinics within 24 hours for appropriate and interested patients. Referral to a mental health professional to assist with complex decisions is recommended.

Females:

- Oophoropexy should be considered for all patients who will be receiving RT.
- Embryo cryopreservation should be discussed if it is possible to delay treatment long enough for a cycle of oocyte stimulation, especially for patients with low- and intermediate-risk HL and low-grade sarcomas.
- Mature oocyte cryopreservation is no longer considered investigational.[35] However, embryo cryopreservation is preferred if a sperm donor has been identified.
- Medroxyprogesterone, oral contraceptives, or GnRH agonists can be used in protocols that are predicted to cause prolonged thrombocytopenia and therefore present a risk for menorrhagia.[44]
- Menstrual suppression with GnRH agonists is not recommended as an option for fertility preservation, because evidence showing that this procedure protects ovarian function during chemotherapy is inconclusive.

Males:

- Sperm banking should be offered for all patients at the time of diagnosis. AYA patients can use either a local sperm bank or the unique collection and preservation kit that is available through the Live: On kit (http://www.liveonkit.com).
- The age and comfort level of individual patients and their caregivers must be considered when discussing sperm banking.
- Oncology centers that treat AYA patients should develop a system for offering sperm banking to all AYA patients in a systematic and patient-centered manner.

Contraception for Women During and After Treatment for Cancer

AYA women with cancer have unique contraception needs, and the options depend on the type of cancer, its treatment, and treatment-related complications.[45] The NCCN Guidelines recommend discussing the use of contraception with patients before initiating treatment (see AYAO-3, page 24).

Long-acting reversible contraception (LARC) with intrauterine devices (IUDs) or implantable contraceptives are more effective than short-term contraceptive methods, which include the use of estrogen and progestin with various delivery systems.[46] LARC has been shown to be superior to short-acting contraceptives in AYA women.[47,48] In a study of 4167 women (14–45 years of age), LARC was associated with higher 12-month compliance rates than oral contraceptive pills (86% vs 55%).[47] In a more recent large prospective study involving 7487 women, the contraceptive failure rate was significantly higher for those using oral contraceptive pills, a patch, or a ring than for those using LARC (4.55 vs 0.27).[48] The failure rates among women younger than 21 years were twice as great as those in women 21 years of age or older.[48]

The Society of Family Planning guidelines recommend IUDs or implantable contraceptives for most women undergoing cancer treatment.[49] The use of any method of contraception is recommended for women who have been free of cancer for at least 6 months and have no history of hormonally mediated cancers, chest wall irradiation, anemia, osteoporosis, or venous thromboembolism (VTE).[49] The use of IUDs is considered the preferred first-

line contraceptive option for women with a history of breast cancer, although for women treated with tamoxifen, levonorgestrel-containing intrauterine system (IUS) may be preferable because it has been shown to reduce tamoxifen-induced endometrial changes without increasing the risk of breast cancer recurrence. Levonorgestrel-containing IUS may be also be used to minimize menstrual blood loss in women with iron-deficiency anemia.[49]

Because of the risk of VTE associated with the use of combined hormonal contraceptive methods, the WHO and the Centers for Disease Control and Prevention recommend that use of these hormonal contraceptives should be avoided in women of childbearing age with active cancer or who have been treated for cancer in the past 6 months.[50]

Management of Cancer During Pregnancy

Cancer is diagnosed in approximately 0.1% of pregnant women and is the second most common cause of maternal death during pregnancy.[51] Cervical, breast, thyroid, and ovarian cancers, melanoma, lymphoma, and leukemia are the most common cancers diagnosed during pregnancy.[52–57] These are also the most common cancers diagnosed in the AYA population.[58]

Selection of an appropriate treatment plan for pregnant women is dependent on individual tumor biology and tumor stage, similar to the management of cancer in nonpregnant women. Most importantly, in addition to the disease characteristics, the gestational age of the fetus is a significant factor in the selection of treatment for pregnant women.[59]

Accurate diagnosis of the type and stage of cancer using appropriate imaging studies (eg, ultrasound, chest radiograph, mammogram) with abdominal shielding and limiting fetal exposure to ionizing radiation is an essential step in the management of cancer during pregnancy.[59] The American College of Radiology developed guidelines to help practitioners identify pregnant patients, prevent unnecessary RT to pregnant AYA women, tailor examinations to effectively manage RT dose, and develop strategies to quantify and evaluate the potential effects of RT in pregnant patients.[60]

Surgery is possible at any time during pregnancy depending on the anatomic location of the tumor, although it may be beneficial to delay surgery, when possible, until after fetus viability.[59] RT is contraindicated during pregnancy. However, in rare instances when RT is necessary, it should be delivered in low therapeutic doses (with adequate uterine shielding to minimize fetal exposure) with the goals of controlling maternal cancer and providing the fetus the best chance for survival with normal development.[61] The dose to the fetus can be reduced by using modified RT administration techniques or adding additional shielding between the treatment machine and the patients.[61] Early collaboration among the radiation oncologist, medical physicist, medical and/or surgical oncologist, and obstetrician is essential.

Chemotherapy should be avoided during the first trimester because of greater risk of teratogenic effects, which include major congenital malformations, impaired organ function, spontaneous abortions, and fetal death.[62–64] Although the use of chemotherapy during the second and third trimesters has not been associated with significant teratogenic effects, it may be associated with low birth weight, preterm labor, and intrauterine growth restriction.[62,64–67] Potential benefits and risks of chemotherapy for both the mother and the fetus must be carefully evaluated before treatment initiation. Delayed treatment until after fetal maturity, with careful follow-up to rule out disease progression, is a safe option for women diagnosed with early-stage cancers.[68,69] In some women diagnosed with advanced-stage disease with an urgent need to start chemotherapy in the first trimester, potential benefits and risks of chemotherapy for both the mother and the fetus must be carefully evaluated before treatment initiation.[66] Because of the severe teratogenic effects of methotrexate, it should be not be used to treat cancer in women at any stage of pregnancy.[64] The safety and efficacy of hormonal agents and targeted therapies have not yet been evaluated in well-controlled studies, including pregnant women.[54,55,59] Currently, the use of these agents in pregnant women is not recommended.

Supportive care for the management of treatment-related side effects should be integrated into treatment planning based on the trimester of pregnancy. Granulocyte colony-stimulating factors for the management of neutropenia, and antiemetics for the management of nausea and vomiting have been used in pregnant women without any significant side effects.[55,70,71]

The panel members acknowledged that management of cancer during pregnancy poses

significant diagnostic and therapeutic challenges for both the patient and the physician. The NCCN Guidelines recommend that AYA women diagnosed with cancer during pregnancy require individualized treatment and that they should be managed by a multidisciplinary team involving medical, surgical, radiation, and gynecologic oncologists; obstetricians; and perinatologists (see AYAO-A, page 26).[66] Referral to a tertiary cancer center with expertise in maternal-fetal medicine and knowledge of the physiological changes that occur during pregnancy should be strongly encouraged.

Summary

AYA patients with cancer should be recognized as a distinct age group that has unique medical and psychosocial needs. It is important for physicians to identify the issues specific to the AYA population and recommend appropriate interventions, with the goal of improving clinical outcomes. All patients should be made aware of the risks of infertility from cancer and its treatment at the time of their cancer diagnosis. Fertility preservation should be an integral part of management of AYA patients with cancer. The use of contraception should be discussed with all AYA women before initiation of treatment. AYA women diagnosed with cancer during pregnancy require individualized treatment by a multidisciplinary team with expertise in maternal-fetal medicine and knowledge of the physiological changes that occur during pregnancy. Most importantly, all AYA patients should have access to age-appropriate supportive care and medical subspecialty services appropriate to their cancer diagnosis.

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Posttest Questions

1. Which of the following options are recommended by the NCCN Guidelines for fertility preservation in females?
   a. Oophoropexy
   b. Embryo cryopreservation
   c. Both a and b
   d. GnRH agonists
2. For AYA women diagnosed with cancer, contraceptive options are dependent on the type of cancer, its treatment, and treatment-related complications.
   a. True
   b. False
3. Which of the following statements are TRUE regarding the management of cancer during pregnancy?
   a. In very rare instances when RT is necessary, it should be delivered in low therapeutic doses with adequate uterine shielding.
   b. Chemotherapy is generally considered safe when used beyond the first trimester.
   c. The use of targeted therapies is not recommended for the management of cancer in pregnant women.
   d. All of the above