Online-only content for "Cardiotoxicity and Breast Cancer as Late Effects of Pediatric and Adolescent Hodgkin Lymphoma Treatment" by Candela in the *American Journal of Nursing*, April 2016, p. 32.

CHEMOTHERAPY — ANTHRACYCLINE ANTIBIOTICS (cont)

Sec #	Therapeutic Agent(s)	Potential Late Effects	Risk Factors	Highest Risk Factors	Periodic Evaluation	Health Counseling/ Further Considerations
34 (female)	**ANTHRACYCLINE ANTIBIOTICS** Daunorubicin Doxorubicin Epirubicin Idarubicin Mitoxantrone **Info Link (Mitoxantrone):** Although Mitoxantrone technically belongs to the anthracenedione class of antitumor antibiotics, it is related to the anthracycline family and is included here because of its cardiotoxic potential. **Info Link (Dose Conversion):** • Pediatric studies of anthracycline cardiotoxicity typically describe risks based on combined cumulative doses of doxorubicin. There is a paucity of literature to support isotoxic dose conversion. • To gauge the frequency of screening, use the following formulas to convert to doxorubicin isotoxic equivalents prior to calculating total cumulative anthracycline dose. **Doxorubicin**: Multiply total dose x 1 **Daunorubicin**: Multiply total dose x 1 **Epirubicin**: Multiply total dose x 0.67 **Idarubicin**: Multiply total dose x 5 **Mitoxantrone**: Multiply total dose x 4 • Clinical judgment should ultimately be used to determine indicated screening for individual patients.	**Cardiac toxicity** Cardiomyopathy Arrhythmias Subclinical left ventricular dysfunction **Info Link** • Dose levels correlating with cardiotoxicity are derived from adult studies. • Childhood cancer patients exhibit clinical and subclinical toxicity at lower levels. • Certain conditions (such as isometric exercise, pregnancy, and viral infections) have been anecdotally reported to precipitate cardiac decompensation. • Prospective studies are needed to better define the contribution of these factors to cardiac disease risk.	**Treatment Factors** Combined with radiation involving the heart Combined with other cardiotoxic chemotherapy - Cyclophosphamide conditioning for HCT - Amsacrine **Medical Conditions** Obesity Congenital heart disease Febrile illness Pregnancy Hypertension Diabetes mellitus **Health Behaviors** Isometric exercise Smoking Drug use (e.g., cocaine, diet pills, ephedra, mahuang)	**Host Factors** Female sex Black/of African descent Younger than age 5 years at time of treatment **Treatment Factors** Higher cumulative anthracycline doses: - ≥ 550 mg/m² in patients 18 years or older at time of treatment - ≥ 300 mg/m² in patients younger than 18 years at time of treatment - Any dose in infant - Chest radiation ≥ 30 Gy Longer time elapsed	**HISTORY** **SOB** **DOE** **Orthopnea** **Chest pain** **Palpitations** **If under 25 yrs: abdominal symptoms (nausea, vomiting)** Yearly **Info Link** • Exertional intolerance is uncommon in patients younger than 25 years old. • Abdominal symptoms (nausea, emesis) may be observed more frequently than exertional dyspnea or chest pain in younger patients. **PHYSICAL** **Cardiac murmur** **S3, S4** **Increased P2 sound** **Pericardial rub** **Rales** **Wheezes** **Jugular venous distension** **Peripheral edema** Yearly **SCREENING** **ECHO (or comparable imaging to evaluate cardiac function))** Baseline at entry into long-term follow-up, then periodically based on age at treatment, radiation dose, and cumulative anthracycline dose. **EKG (include evaluation of QTc interval)** Baseline at entry into long-term follow-up, repeat as clinically indicated.	**Health Links** **Heart Health** **Cardiovascular Risk Factors** **Counseling** Counsel patients with prolonged QTc interval about use of medications that may further prolong the QTc interval (e.g., tricyclic anti-depressants, antifungals, macrolide antibiotics, metronidazole). Counsel regarding maintaining appropriate weight, blood pressure and heart-healthy diet. Counsel regarding appropriate exercise. Aerobic exercise is generally safe and should be encouraged for most patients. Intensive isometric activities (e.g., heavy weight lifting, wrestling) should generally be avoided. High repetition weight lifting involving lighter weights is more likely to be safe. The number of repetitions should be limited to that which the survivor can perform with ease. Patients who choose to engage in strenuous or varsity team sports should discuss appropriate guidelines and a plan for ongoing monitoring with a cardiologist. **Considerations for Further Testing and Intervention** Cardiology consultation in patients with subclinical abnormalities on screening evaluations, left ventricular dysfunction, dysrhythmia, or prolonged QTc interval. Consider excess risk of intensive isometric exercise program in any high risk patient (defined as needing screening every 1 or 2 years). Additional cardiology evaluation in patients who received ≥ 300 mg/m² or < 300 mg/m² plus chest radiation who are pregnant or planning pregnancy. Evaluation to include an echocardiogram before and periodically during pregnancy (especially during third trimester) and monitoring during labor and delivery due to risk of cardiac failure. **SYSTEM = Cardiovascular** **SCORE = 1**

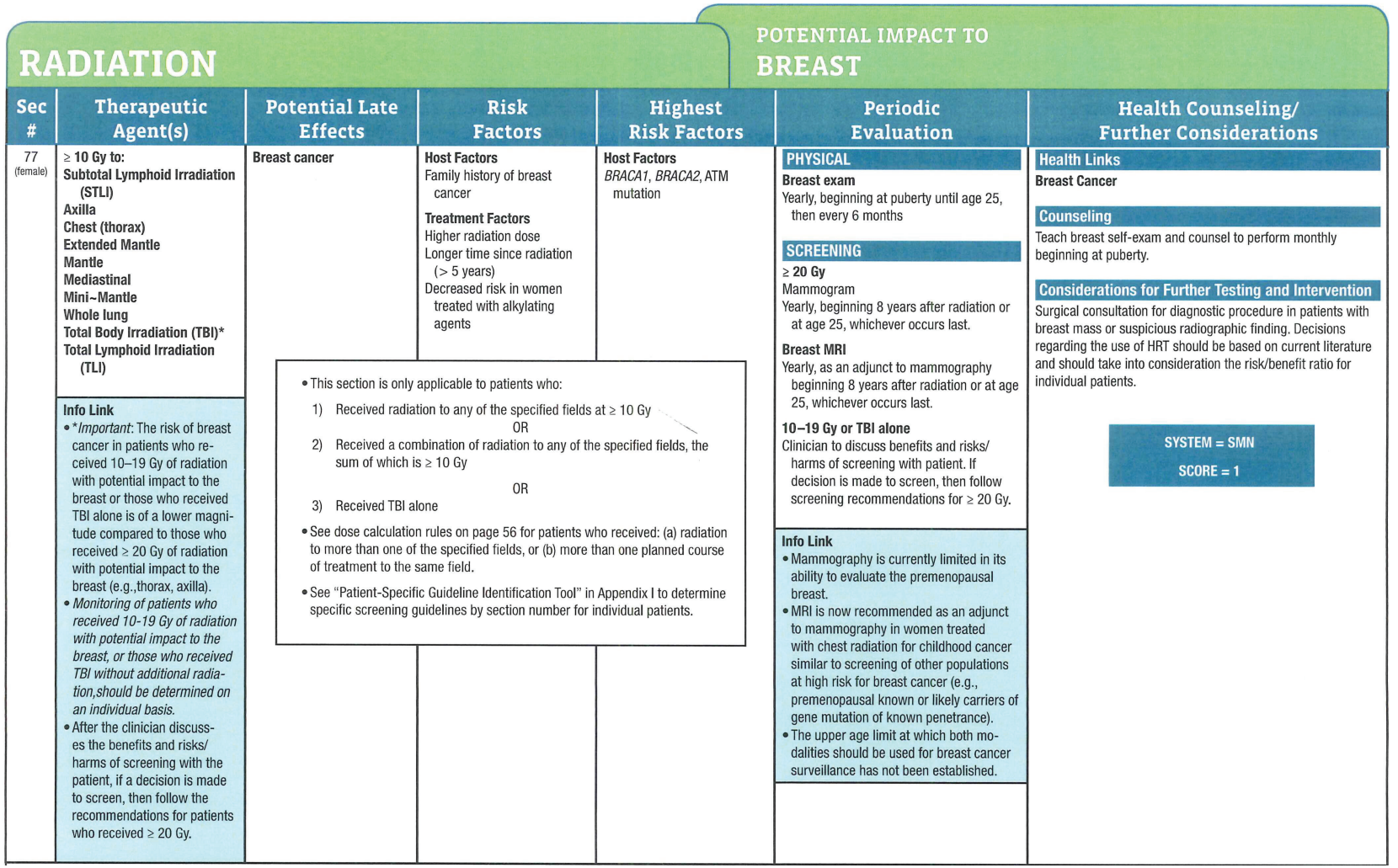

Figure 3. Guidelines for patients with a history of treatment for Hodgkin lymphoma who are at risk for the potential late adverse effects of cardiotoxicity and breast cancer. From the Children's Oncology Group's *Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers*, Version 4.0, October 2013. Used with permission.