Short Communication

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Algorithm for Cancer Screening (Intellectual property of CitiScreen Inc)

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Breast Cancer Screening Algorithm

	Screening age	
Average risk		Annual screening mammogram
		Annual breast sonogram
Regular breasts:	≥ 40	Annual breast sonogram
Dense breasts:	≥ 40	Breast MRI
High-Risk		
Genetic factors	30	Annual breast sonogram
Positive BRCA1 or BRCA2		Annual MRI
Strategies (e.g., prophylactic mastectomy)		Consideration for risk reduction

Tumor Marker Screening

ATM	Annual breast sonogram, Annual breast MRI with contrast starting at age 30 years
CDH1	Annual breast sonogram, Annual breast MRI with contrast starting at age 30 years.
CHEK2	Annual breast MRI with contrast starting at age 30 years
NBN	Annual breast sonogram, Annual breast MRI with contrast starting at age 40 years
NF1	Annual breast sonogram, Annual breast MRI with contrast starting at age 30 years

Breast MRI and breast sonogram are to be performed 6 months apart.

Thoracic radiation therapy ≤ 25 years *Annual screening mammogram*
Annual sonogram
Annual MRI in cases of dense breasts

Lobular Carcinoma in Situ (LCIS)

Atypical Ductal Hyperplasia (ADH) Begin at diagnosis of *Annual MRI w/ contrast*
Atypical Lobular Hyperplasia (ALH) LCIS or ADH/ALH Consider risk reduction strategies

Genetic /Familial Breast Cancer Screening [1]

Hereditary cancers are caused by mutations associated with a high probability of cancer (i.e., a high penetrance genotype) or vertical transmission through either parent [1]. Familial breast cancers occur in a given family more frequently than in the general population; they do not exhibit the inheritance patterns consistent with hereditary cancers [2].

Screening Protocols for Hereditary/Familial Breast Cancer:

Risk Factors One or more of the following: <ul style="list-style-type: none"> • Early age at onset of breast cancer • Two breast primaries or breast and ovarian/fallopian tube cancer, or two or more breast cancer primaries • A combination of breast cancer with one or more of the following: thyroid cancer, sarcoma, adrenocortical carcinoma, endometrial cancer, pancreatic cancer, brain tumors, gastric cancer • Family member with a known mutation in a breast cancer susceptibility gene 	→ Referral to cancer genetics →	Management Algorithm Patient needs and concerns: <ul style="list-style-type: none"> • Family cancer-risk assessment Detailed family history: <ul style="list-style-type: none"> • Family pedigree to include first-, second-, and third- degree relatives (parents, children, siblings, aunts, uncles, grandparents, great-grandparents, nieces, nephews, grandchildren, first cousins) • Types of cancer • Bilaterality • Age at diagnosis • Any personal cancer history • Carcinogen exposure (e.g., history of radiation therapy) • Reproductive history • Hormone use 	→ <ul style="list-style-type: none"> • Breast MRI at age 25 • Option of preventative mastectomy
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Breast Cancer Screening Protocols In Rare Hereditary Syndromes

Breast Cancer

- Annual mammogram and/or breast MRI screening starting at age 20, or individualized based on earliest age of onset in family.
- Option of risk-reducing mastectomy with reconstruction options.

Other Cancer Risks

- Annual comprehensive physical exam with high index of suspicion for second malignancies.
- Colonoscopy every 2-5 years starting no later than the age of 25 years.
- Discuss option of PET scan, abdominal ultrasound, and brain MRI.

Risk to Relatives

- Advise about possible inherited cancer risk to relatives, options for risk assessment and management.
- Recommend genetic counseling and consideration of genetic testing for at-risk relatives.

Cowden Syndrome

Women:

- Annual mammography and breast MRI screening starting at age 30 years or 10 years before the earliest known breast cancer in the family (whichever comes first) [3,4].
- Endometrial cancer screening
- Option for risk-reducing mastectomy and hysterectomy

Men and Women

- Annual comprehensive physical exam starting at age 18 years, or 5 years before the youngest age of diagnosis of a component cancer.
- Baseline thyroid ultrasound at age 18 years, and annually thereafter.

Risk to Relatives

- Advise about possible inherited cancer risk to relatives.
- Recommend genetic counseling and consideration of genetic testing for at-risk relatives.

Screening for Endometrial Cancer

Endometrial cancer is the most common gynecological malignancy with 61,380 estimated new cases in 2017 in the United States

[3]. The incidence of endometrial cancer has been rising with higher prevalence of obesity and diabetes [4]. The most common screening test for endometrial cancer is the transvaginal ultrasound, which measures the thickness of the endometrium. The potential of ultrasounds as a screening test is undermined by its inability to reliably distinguish between benign and malignant lesions [1]. The addition of Doppler technology appears helpful. Endometrial blood flow was normal in all atrophic cases, and in 92% of hyperplastic endometrium cases [2]. The ACS recommends that women at average and increased risk should be informed about the symptoms of endometrial cancer at the onset of menopause (unexpected bleeding and spotting). Women at very high risk for endometrial cancer (Lynch syndrome and genetic mutation carrier status) should undergo a screening protocol. The new test, called PapSEEK, incorporates assays for mutations in 18 genes [5]. Most endometrial cancers could be detected with PapSEEK [5]. The most commonly mutated genes in the were PTEN (63%), TP53 (42%), PIK3CA (36%), PIK3R1 (20%), KRAS (17%), CTNNB1 (15%), RNF43 (11%), PPP2R1A (7%), POLE (7%), and FBXW7 (6%) [5].

References

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