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Benefits, harms and burden of colorectal cancer screening among childhood cancer survivors previously treated with abdominal-pelvic radiation

Background: Survivors of childhood cancer treated with abdominal-pelvic radiation are at increased risk for colorectal cancer (CRC). The Children's Oncology Group recommends early initiation of CRC screening at age 30, yet the benefits and burden are unknown.

Methods: We used incidence and mortality data from the Childhood Cancer Survivor Study to modify the SimCRC model from the Cancer Intervention and Surveillance Modeling Network (CISNET) to reflect high CRC and competing mortality risks among survivors, assuming the elevated cancer risk arises from higher adenoma onset. Strategies evaluated varied by modality (no screening, colonoscopy, multitarget stool DNA [mtsDNA] testing, fecal immunochemical testing [FIT]), screening start age (25, 30, 35, 40, 45) and screening interval (every 3, 5 or 10 yrs for colonoscopy; every 1, 2 or 3 yrs for mtsDNA and FIT). Abnormal stool test results were followed up with colonoscopy. Screening performance and complication rates were based on published studies. Analyses assumed full uptake and adherence to all screening and follow-up procedures. To identify the optimal strategy for each modality, we estimated the number of colonoscopies required per additional life-year gained and compared it to benchmarks for screening strateties recommended by the US Preventive Services Task Force for average-risk individuals.

Results: Among a simulated cohort of 20-yr-old 5-yr survivors with a history of abdominal-pelvic radiation, the cumulative CRC risk at age 50 was 0.8%, approximately twice that predicted among general population average-risk individuals (0.4%). In the absence of screening, 73 per 1000 survivors would be diagnosed with CRC in their lifetime and 29 would die from the disease. All screening strategies evaluated were estimated to yield substantial reductions in the lifetime number of CRC cases (45-71 cases averted per 1000) and deaths (23-28 deaths averted per 1000). The estimated lifetime number of colonoscopies ranged from 1781 to 14,625 per 1000. The lifetime number of colonoscopy complications was relatively low at 9 to 20 per 1000. Based on the burden-to-benefit ratios, colonoscopy every 10 yrs starting at age 30, mtsDNA every 3 yrs starting at age 30, or FIT every 3 yrs starting at age 25 were the optimal screening strategies identified (Table).

Conclusions: Early initiation of screening may substantially reduce CRC mortality among high-risk childhood cancer survivors. These estimates of the balance of screening benefits and burden can inform follow-up care guidelines.

Table. Model results per 1000 survivors for optimal screening strategies*

Strategy	Benefits			Burden	Harms
	CRC cases averted	CRC deaths averted	Life-years gained	Colonoscopies	Colonoscopy complications
Colonoscopy, age 30, every 10y	61	26	342	4373	10
mtsDNA age 30, every 3y	53	25	333	2457	9
FIT age 25, every 3y	53	26	334	2190	9

*Compared to no screening