Kardio-onkologie 2022

Sledování pacientů po ukončené onkologické léčbě

Lubomír Elbl

ESC European Society of Cardiology
European Heart Journal (2022) 00, 1–133
https://doi.org/10.1093/eurheartj/ehac244
ESC GUIDELINES

6. výroční sjezd ČAAMK Olomouc 2023

Cancer Facts & Figures 2014

American Cancer Society. *Cancer Facts & Figures 2014*. Atlanta: American Cancer Society; 2014

Figure 2. Trends in Pediatric Cancer Incidence Rates by Site, Ages 0-19, 1975-2010

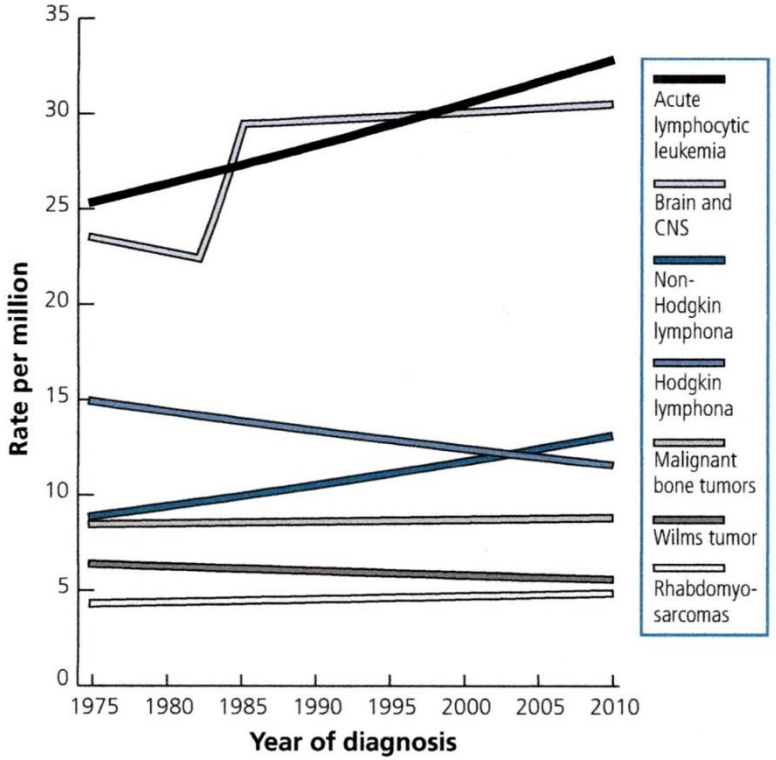
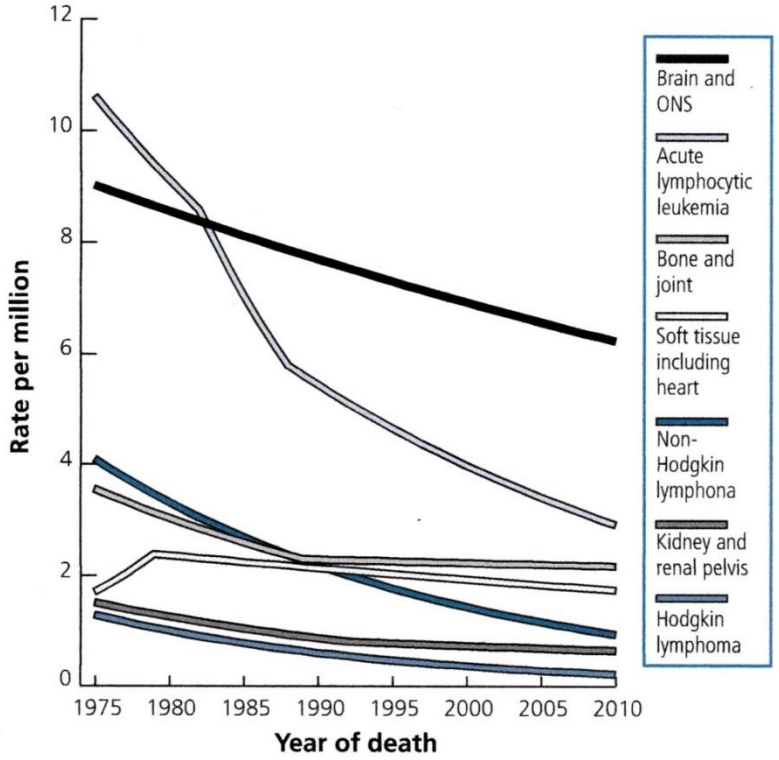
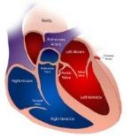


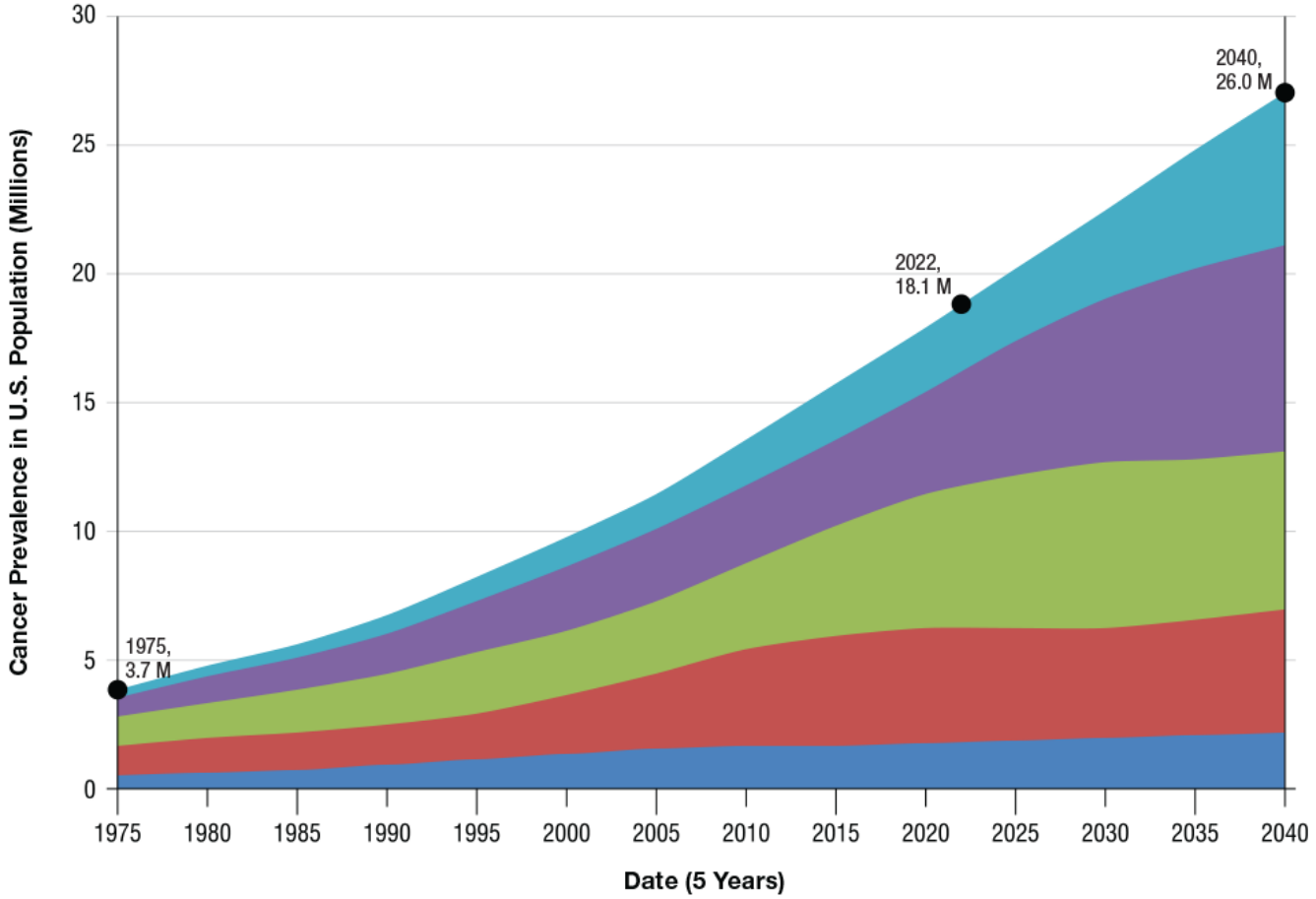
Figure 3. Trends in Pediatric Cancer Mortality Rates by Site, Ages 0-19, 1975-2010





24% nárůst
Během 10 let

Cancer Prevalence and Projections in U.S. Population from 1975–2040



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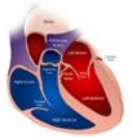
Bluethmann SM, Mariotto AB, Rowland JH. Anticipating the "Silver Tsunami": Prevalence Trajectories and Comorbidity Burden among Older Cancer Survivors in the United States. Cancer Epidemiol Biomarkers Prev. 2016 Jul;25(7):1029-36.

Miller KD, Nogueira L, Devasia T, Mariotto AB, Yabroff KR, Jemal A, Kramer J and Siegel RL. Cancer Treatment and Survivorship Statistics. CA A Cancer J Clin. 2022.



ELEKTRICKÁ NESTABILITA MYOKARDU
AKUTNÍ ISCHÉMIE

5-FU
Capecitabin
Pentostatin
Interferon
Dasatinib
Sunitinib
Pazopanib
Bortezomib
Vandetanib
Carfilzomib

VASKULÁRNÍ ABNORMITY
PLICNÍ HYPERTENSE

Cisplatina
Vincristin
Bevacizumab
Dasatinib
Carfilzomib
Sunitinib
Sorafenib
Pazopanib
Ponatinib

Potencionální kardiotoxický efekt protinádorových léků

POŠKODZENÍ PERIKARDU

Cyklofosfamid
Busulfan
Clofarabin
Cytarabin
Dasatinib
Imatinib
All-trans-retinoic
Radiační terapie

POŠKOZENÍ MYOKARDU

Antracykliny
Cyklofosfamid
Mitoxantron
Sorafenib
Pazopanib

Trastuzumab
Tramatenib
Bortezomib
Carfilzomib

Radiační terapie

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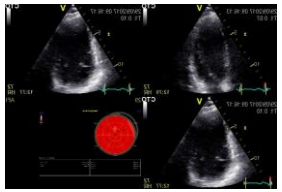
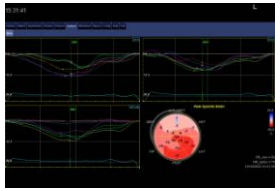
CENTRA

AMBULANCE

KARDIOLOGICKÉ
Monitorování



EF LK
GLS
Troponiny
BNP/NTproBNP



TERAPIE ROK PO TERAPII > ROK PO TERAPII

Akutní **Subakutní** **Chronická** **Pozdní toxicita**

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SRDEČNÍ SELHÁNÍ

ARYTMIE
(fibrilace síní)

METABOLICKÝ
SYNDROM

ANTIKOAGULACE:
OAC / DOAC

KARDIO – ONKOLOGIE
V SEKUNDÁRNÍ PREVENCI

KARDIOCHIRURGIE

KARDIOTOXICITA
PROTINÁDOROVÉ LÉČBY

INVAZIVNÍ KARDIOLOGIE

GRAVIDITA

DĚTSKÁ
ONKOLOGIE

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Table 12 Risk categories for asymptomatic adult cancer survivors

Risk category[a]	Patient characteristics
Very high risk	• Very high baseline CV toxicity risk pre-treatment • Doxorubicin[b] ≥ 400 mg/m^2 • RT > 25 Gy MHD[c] • RT > 15–25 Gy MHD[c] + doxorubicin[b] ≥100 mg/m^2
Early high risk (<5 years after therapy)	• High baseline CV toxicity risk • Symptomatic or asymptomatic moderate-to-severe CTRCD during treatment • Doxorubicin[b] 250–399 mg/m^2 • High-risk HSCT[d]
Late high risk	• RT > 15–25 Gy MHD[c] • RT 5–15 Gy MHD[e] + doxorubicin[b] ≥100 mg/m^2 • Poorly controlled CVRF
Moderate risk	• Moderate baseline CV toxicity risk • Doxorubicin[b] 100–249 mg/m^2 • RT 5–15 Gy MHD[e] • RT < 5 Gy MHD[f] + doxorubicin[b] ≥ 100 mg/m^2
Low risk	• Low baseline CV toxicity risk and normal end-of-therapy cardiac assessment • Mild CTRCD during therapy but recovered by the end of cancer therapy • RT < 5 Gy MHD[f] • Doxorubicin[b] < 100 mg/m^2

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Table 10 Risk factors for future cardiovascular disease at the end-of-cancer therapy cardiovascular risk assessment

High-risk conditions

High- and very-high baseline CV toxicity risk based on HFA-ICOS assessment

Specific anticancer treatment proven to have a high risk of long-term CV complications[a]

- Doxorubicin[b] ≥ 250 mg/m^2
- RT > 15 Gy MHD[c]
- Both doxorubicin[b] ≥ 100 mg/m^2 and RT 5–15 Gy MHD[d]
- High-risk HSCT patients[e]

Moderate or severe CTR-CVT during cancer treatment (especially CTRCD), ICI-related myocarditis, cardiac arrhythmias, or severe vascular toxicities (ACS, stroke, PVD)

New CV symptoms or new asymptomatic abnormalities in echocardiography and/or cardiac serum biomarkers at the end of therapy assessment

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Cardio-Oncology Care Pathways

	New cancer diagnosis	During cancer treatment[a]	First year after cancer treatment[b]	Long term follow-up
Baseline CV toxicity risk assessment[c]	Informing, advising, and supporting patients to promote a healthy lifestyle			
	Management of CVRF and CVD according to ESC Guidelines			
Low risk patients	Standard surveillance	Assessment at 1 year after completion of cancer therapy	Annual CVRF assessment[e]	
			Reassessment if new CV signs/symptoms	
Moderate risk patients	Cardiology referral[d]	Assessment at 1 year after completion of cancer therapy	Annual CVRF assessment[e] CV toxicity re-stratification at 5 years	
			TTE every 5 years	
High and very high risk patients	Cardiology referral[d] CVD prevention	Assessment at 3 months and 1 year after completion of cancer therapy	Annual CVRF assessment[e]	
			TTE at years 1, 3, 5 and every 5 years	
Cardiology referral[d] if new CV signs/symptoms or CTR-CVT develop				

Class I Class IIa Class IIb

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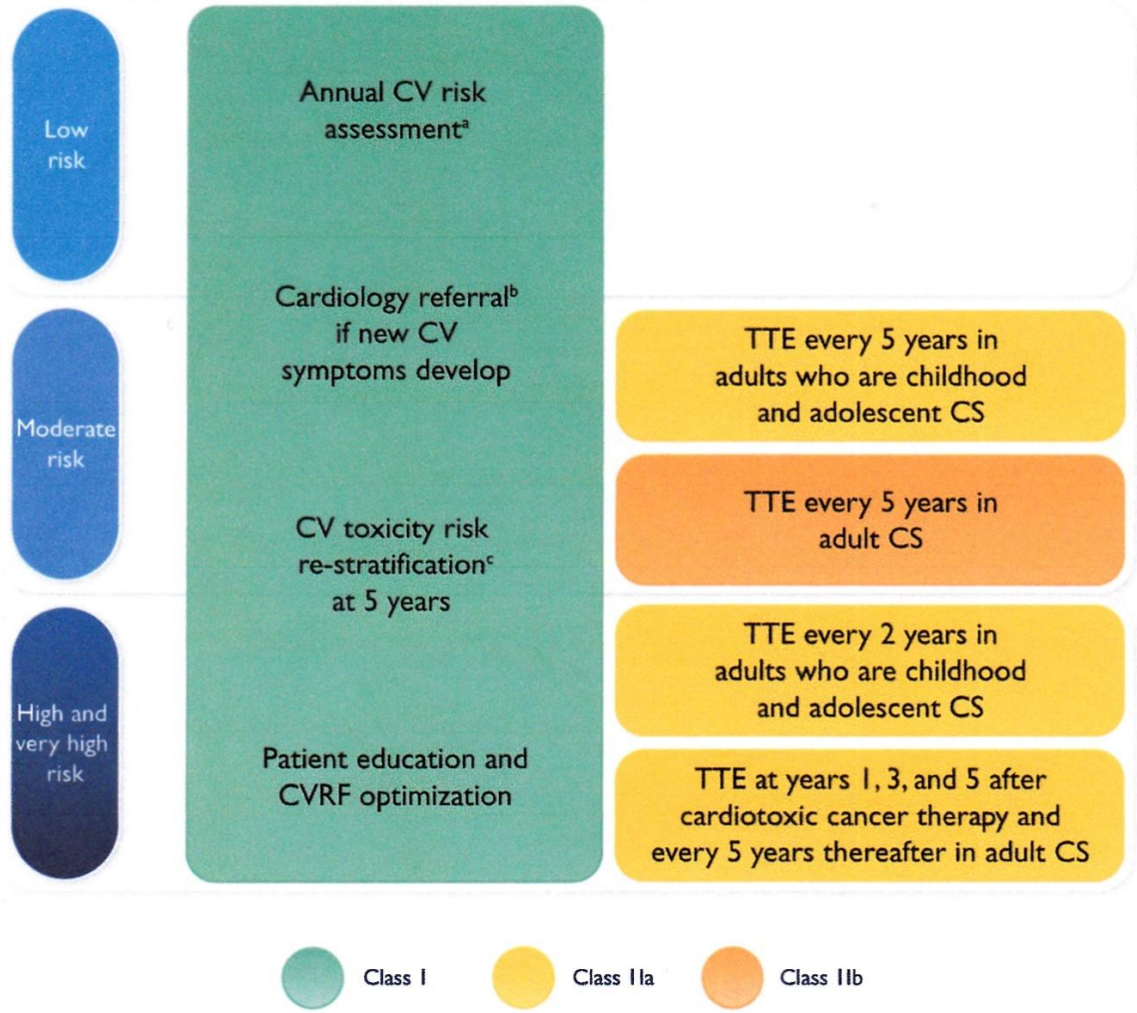
Long-term surveillance in asymptomatic CS



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Recommendation Table 42 — Recommendations for adult cancer survivors who develop cancer therapy-related cardiac dysfunction late after cardiotoxic cancer therapy

Recommendations	Class[a]	Level[b]
ACE-I/ARB and/or beta-blockers are recommended in adult CS with moderate asymptomatic CTRCD.[c,208,425,675–678]	I	C
ACE-I/ARB and/or beta-blockers may be considered in adult CS with mild asymptomatic CTRCD.[d]	IIb	C

ACE-I, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blockers; CS, cancer survivors; CTRCD, cancer therapy-related cardiac dysfunction; GLS, global longitudinal strain; LVEF, left ventricular ejection fraction.
[a]Class of recommendation.
[b]Level of evidence.
[c]New LVEF reduction by ≥10 percentage points to an LVEF of 40–49% OR new LVEF reduction by <10 percentage points to an LVEF of 40–49% AND either new relative decline in GLS by >15% from baseline OR new rise in cardiac biomarkers.
[d]LVEF ≥ 50% and new relative decline in GLS by >15% from baseline AND/OR new rise in cardiac biomarkers.

Recommendation Table 4 — Recommendations for cardiac imaging modalities in patients with cancer

General	Class[a]	Level[b]
Echocardiography is recommended as the first-line modality for the assessment of cardiac function in patients with cancer.[4,12,54,94]	I	C
3D echocardiography is recommended as the preferred echocardiographic modality to measure LVEF.[77–79,89]	I	B
GLS is recommended in all patients with cancer having echocardiography, if available.[75,80,81,89,90,92,93,102,103]	I	C
CMR should be considered for the assessment of cardiac function when echocardiography is unavailable or non-diagnostic.[83,104,105]	IIa	C
MUGA may be considered when TTE is not diagnostic and CMR is not available.[106–108]	IIb	C
Baseline cardiac imaging prior to potentially cardiotoxic therapies[c]		
Baseline comprehensive TTE is recommended in all patients with cancer at high risk and very high risk of CV toxicity before starting anticancer therapy.[d,54]	I	C

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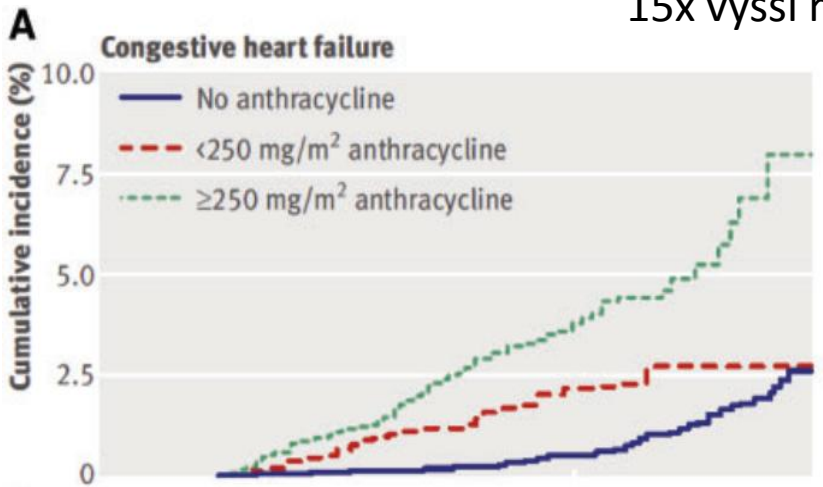
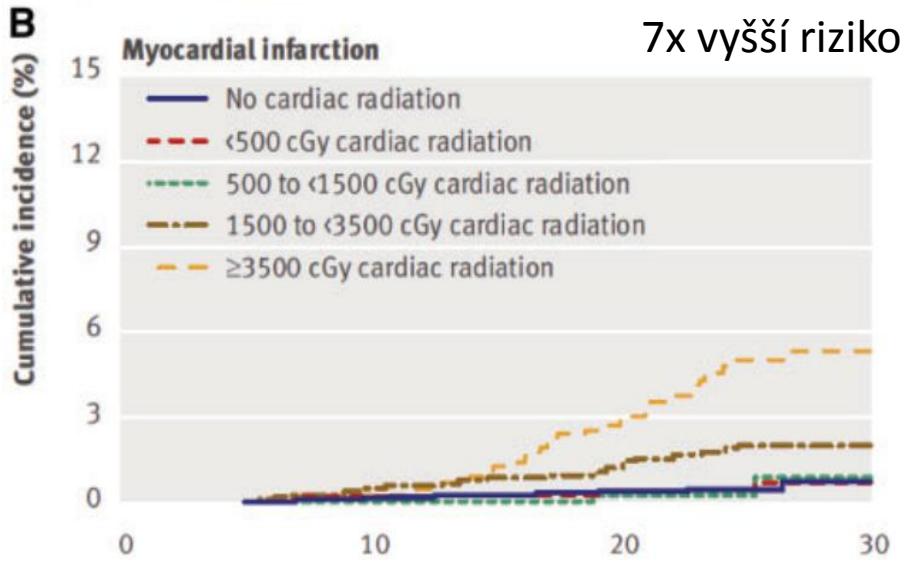
POZDNÍ KARDIOTOXICITA CHEMOTERAPIE A RADIOTERAPIE

15x vyšší riziko



7x vyšší riziko



Chow EJ et al. Cardiovascular Research 2019; 115: 922–934

RIZIKOVÉ FAKTORY ICHS

7 x vyšší kardiovaskulární mortalita
15x vyšší incidence srdečního selhání
10x vyšší prevalence ICHS
9x vyšší výskyt COM

Covielo JS, J Adv Pract Oncol 2018;9(2):160–176

Mortalita na KV nemoci
7.31x vyšší u MH
5.35x vyšší u NHL

Boyne DJ et al. Cancer Medicine 2018;7:4801–4813

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1. Nezávislý RF srdečního selhání
    1. Antracykliny
    2. Inhibitory proteinových kináz
        Ibrutinib
        Sunitinib

2. Metabolický syndrom
3. Zvýšený výskyt u dětí a adolescentů
4. Změna medikace během onkologické terapie
5. Hypertense způsobená terapií

Recommended threshold for asymptomatic hypertension treatment in different clinical scenarios

Home BP mmHg	CS	Curable cancer during treatment	Metastatic cancer Prognosis >3 years	Metastatic cancer Prognosis 1–3 years	Metastatic cancer Prognosis <1 year
160+	Treat	Treat	Treat	Treat	Treat
140–159	Treat	Treat	Treat	Consider treatment	May treat
135–139	Treat	May treat	Consider treatment	May treat	None
130–134	May treat	None	None	None	None
<130	None	None	None	None	None

Class I Class IIa Class IIb

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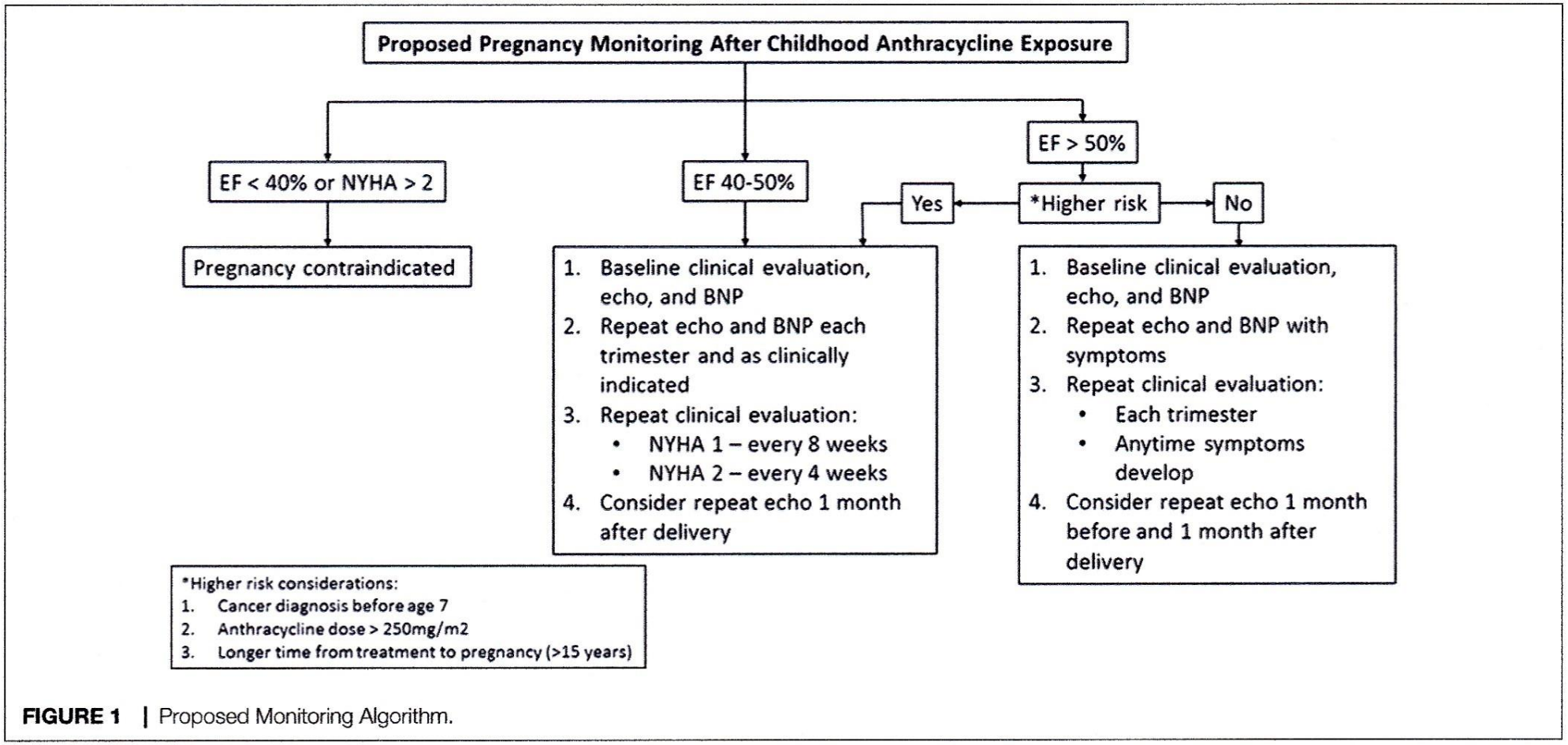

FIGURE 1 | Proposed Monitoring Algorithm.

Thompson KA Front. Cardiovasc. Med. 5:14. doi: 10.3389/fcvm.2018.00014

Recommendation Table 46 — Recommendations for cardiovascular monitoring in cancer survivors during pregnancy

Recommendations	Class[a]	Level[b]
In high-risk female CS, pre-pregnancy counselling and management during pregnancy and around delivery by a multidisciplinary pregnancy heart team is recommended.	I	C
A baseline CV evaluation including history, physical examination, ECG, NP, and echocardiography is recommended in female CS with a history of CTRCD who are considering pregnancy.	I	C
A baseline CV evaluation including history, physical examination, ECG, and echocardiography should be considered in all female CS who received potentially cardiotoxic cancer therapy and are considering pregnancy.	IIa	C
A CV evaluation including echocardiography is recommended at 12 weeks of pregnancy in female CS who are either high-risk or who received potentially cardiotoxic cancer therapy and did not have a baseline CV assessment.	I	C
A second CV evaluation including echocardiography should be considered at 20 weeks of pregnancy in high-risk female CS[c] who received potentially cardiotoxic cancer therapy.	IIa	C

1. 60% terapie s antracykliny, popřípadě ozáření mediastina
2. 15x vetší riziko CTRCD
3. Incidence 28% (pokles EFLK < 50% ve dvou měřeních)
4. Hlavní rizikové faktory:
   a. Mladší věk v době stanovení dg. malignity
   b. Delší časový interval od ukončení terapie po první graviditu
   c. KD antracyklinů

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KARDIOTOXICITA RADIOTERAPIE

- KLINICKÉ PROJEVY

1. Poškození perikardu
2. Kardiomyopatie
3. Ateroskleróza věnčitých tepen (ostiální stenózy)
4. Mikrovaskulární poškození koronárního řečiště
5. Ateroskleróza karotických tepen
6. Poškození chlopní (Aorta)
7. Arytmie (poruchy vedení)

Recommendation Table 45 — Recommendation for adult cancer survivors with pericardial complications

Recommendation	Class[a]	Level[b]
Patients with acute pericarditis during RT to a volume including the heart are at higher risk of developing chronic constrictive pericarditis, hence echocardiography surveillance every 5 years may be considered.	IIb	C

RT, radiotherapy.
[a]Class of recommendation.
[b]Level of evidence.

- RIZIKOVÉ FAKTORY

1. Věk < 15 a > 65 let
2. Ozáření mediastina a levého hemithoraxu
3. KD > 2 Gy/den nebo celková KD > 25 Gy
4. CHT antracykliny
5. Přítomnost kteréhokoliv RF KVS onemocnění
6. Přítomnost KVS onemocnění, především ICHS, předchozí srdeční infarkt

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PREGRADUÁLNÍ VÝUKA

POSTGRADUÁLNÍ VÝUKA

- Lékařská fakulta
- Odborné společnosti
- Pracovní skupiny / asociace

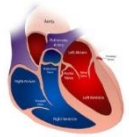
KARDIO-ONKOLOGIE

PRIMÁRNÍ CENTRUM:

ONKOLOGICKÉ A KARDIOLOGICKÉ CENTRUM

SEKUNDÁRNÍ CENTRA:

- Praktik
- Pediatr
- Ambulantní specialista
- Ambulance pozdních následků onkologické léčby



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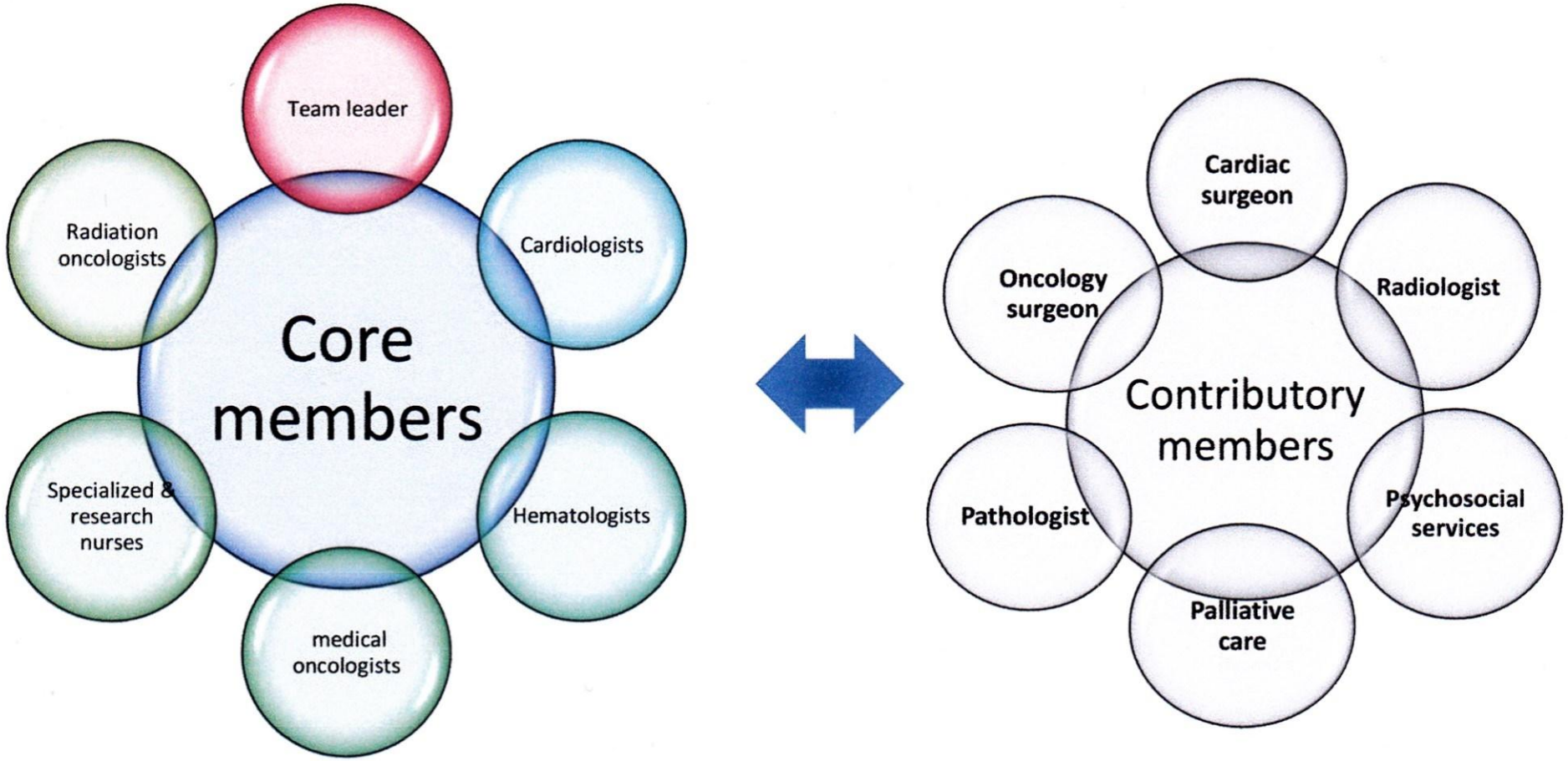
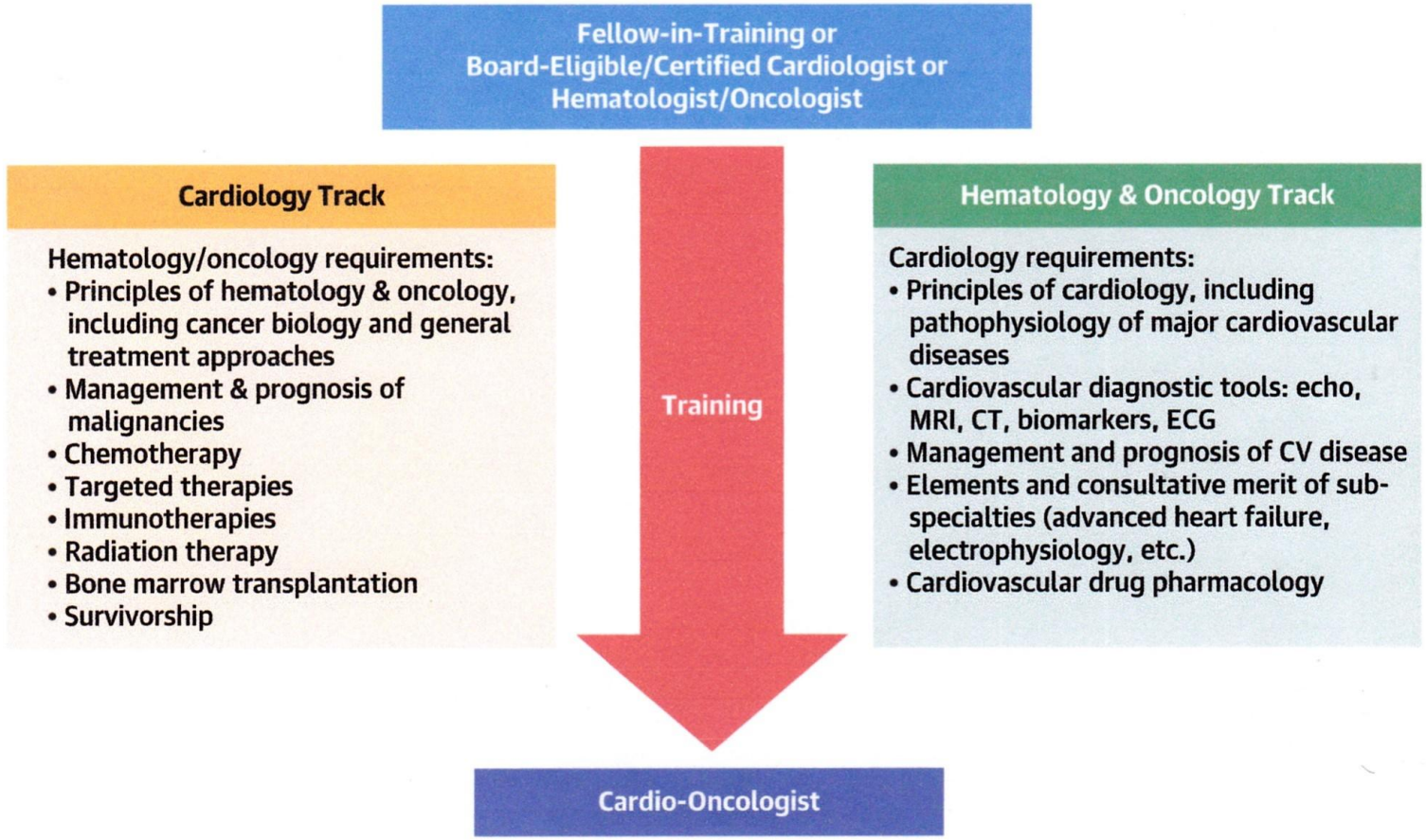


ESC HEART FAILURE ESC Heart Failure 2020; 7: 2175–2183 Published online 30 June 2020 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/ehf2.12838

ESC European Society of Cardiology European Heart Journal (2022) 00, 1–133 https://doi.org/10.1093/eurheartj/ehac244 ESC GUIDELINES

FIGURE 2 Road to Cardio-Oncology Based on Prior Training Track



Both cardiology and hematology/oncology fellows are eligible for training in cardio-oncology. Their training needs, however, differ, emphasizing the learning of the knowledge of their counterpart discipline. CT = computed tomography; CV = cardiovascular; ECG = electrocardiography; MRI = magnetic resonance imaging.

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TABLE 5 List of Cardio-Oncology Fellowship Programs in the United States

Name of Program	Location	Contact Information	Program Description
Mayo Clinic	Rochester, Minnesota	Martha Grogan, MD E-mail: grogan.martha@mayo.edu Phone: (507) 284-3667; education coordinator Kris Baldwin	1-yr fellowship (board-eligible cardiology trainees/certified cardiologists) with focus on cardiac amyloidosis and cardio-oncology
Memorial Sloan Kettering Cancer Center	New York, New York	Sade Gibbons E-mail: gibbonss@mskcc.org Phone: (212) 639-5154	1- to 2-yr research and clinical fellowship in cardio-oncology for board-eligible/certified cardiologists
University of Alabama	Birmingham, Alabama	Carrie Lenneman, MD E-mail: clenneman@uabmc.edu Phone: (205) 975-7123	2-yr program with 1 yr dedicated to clinical cardio-oncology and additional year to complete a clinical research project on a T32 grant
University of Pennsylvania	Philadelphia, Pennsylvania	Joseph Carver, MD E-mail: jrc@mail.upenn.edu Phone: not available	Either a 3-month rotation for cardiology or oncology fellows, or a 1-yr intensive training position for board-eligible/certified cardiologists or oncologists
University of Texas MD Anderson Cancer Center	Houston, Texas	Lauren Sutton E-mail: lmsutton1@mdanderson.org Phone: (713) 792-1958	1-yr clinical and research fellowship
University of South Florida & Moffitt Cancer Center	Tampa, Florida	Twyla Sumpter Fellowship coordinator E-mail: tsumpter@health.usf.edu Phone: (813) 259-0600	1-yr clinical and research fellowship
Vanderbilt University	Nashville, Tennessee	Javid Moslehi, MD E-mail: javid.moslehi@vanderbilt.edu Phone: not available	1- or 2-yr clinical and research fellowship
Washington University School of Medicine	St. Louis, Missouri	Joshua Mitchell, MD E-mail: jdmitchell@wustl.edu Phone: (314) 273-2255	1-yr program designed to provide comprehensive exposure to all aspects of inpatient and outpatient cardio-oncology and cardiac amyloidosis

Programs are listed in alphabetical order and are current as of June 2020; the most up-to-date status is available on the American College of Cardiology website.

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