Longkanker en hartziekten

wat als beide belangrijk zijn?

Symposium oktober 2026
Dr. Philippe Mortelmans

SITUERING CARDIO-ONCOLOGIE

Klassiek

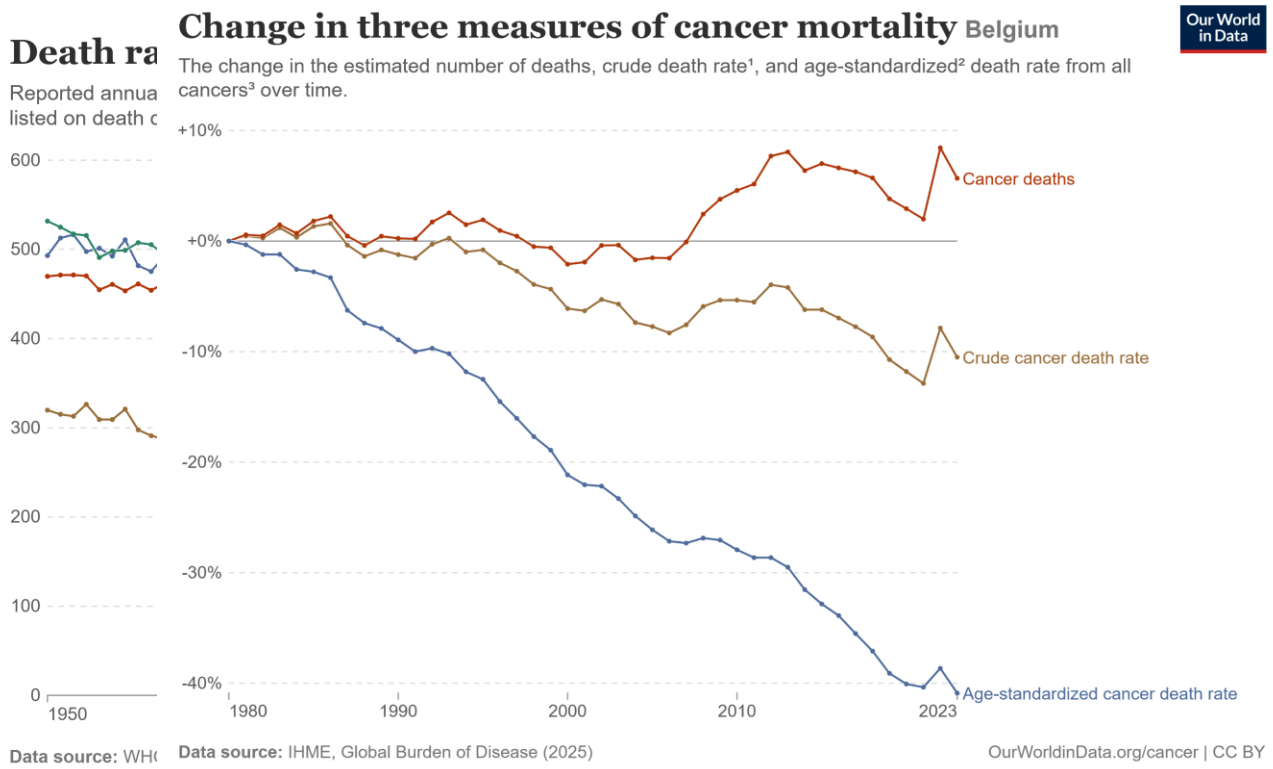
kankerbehandelingen geven cardiale nevenwerkingen

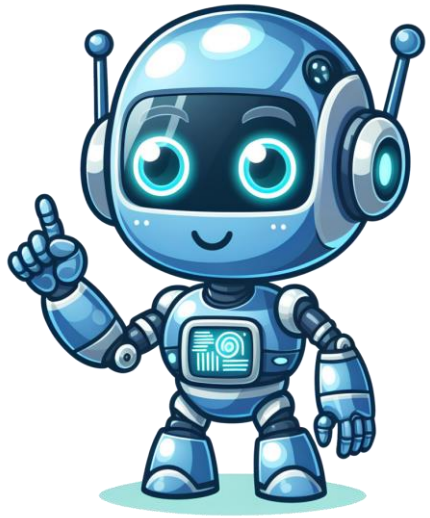
- antracyclines
- trastuzumab (Herceptine)



Vandaag

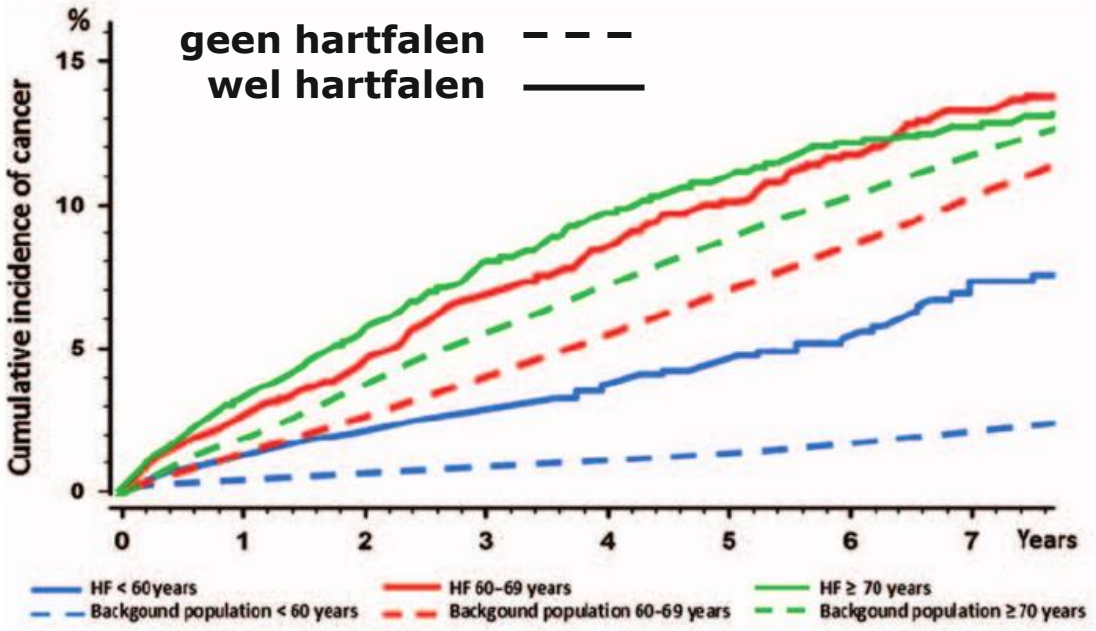
- nieuwe oncologische behandelingen
- mortaliteit ↓ => ptn met beide ↑





Is er een directe link?

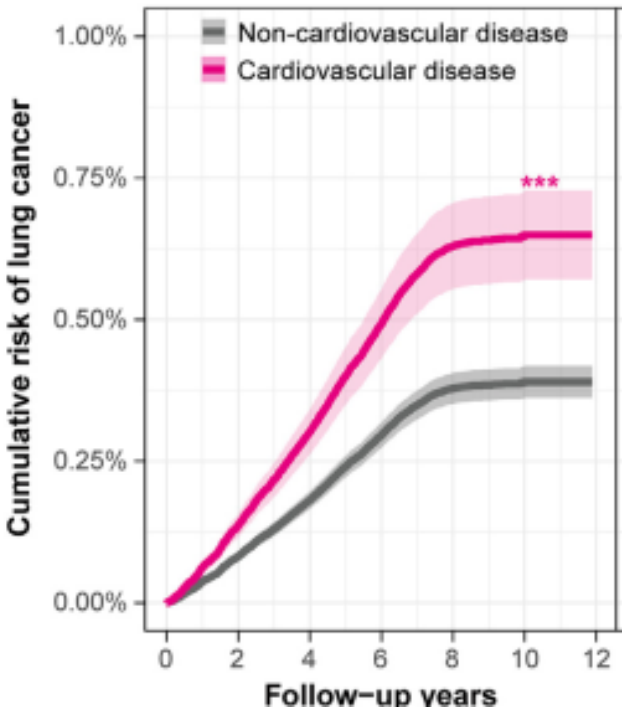
- oncopatiënt
  - coronairlijden/hartfalen/CVA x 10
  - na genezing: CV dood x 10 tov algemene bevolking
  - " kanker is een onafhankelijke CV risicofactor"
- hartfalenpatiënt
  - kanker +24% over alle leeftijdsgroepen

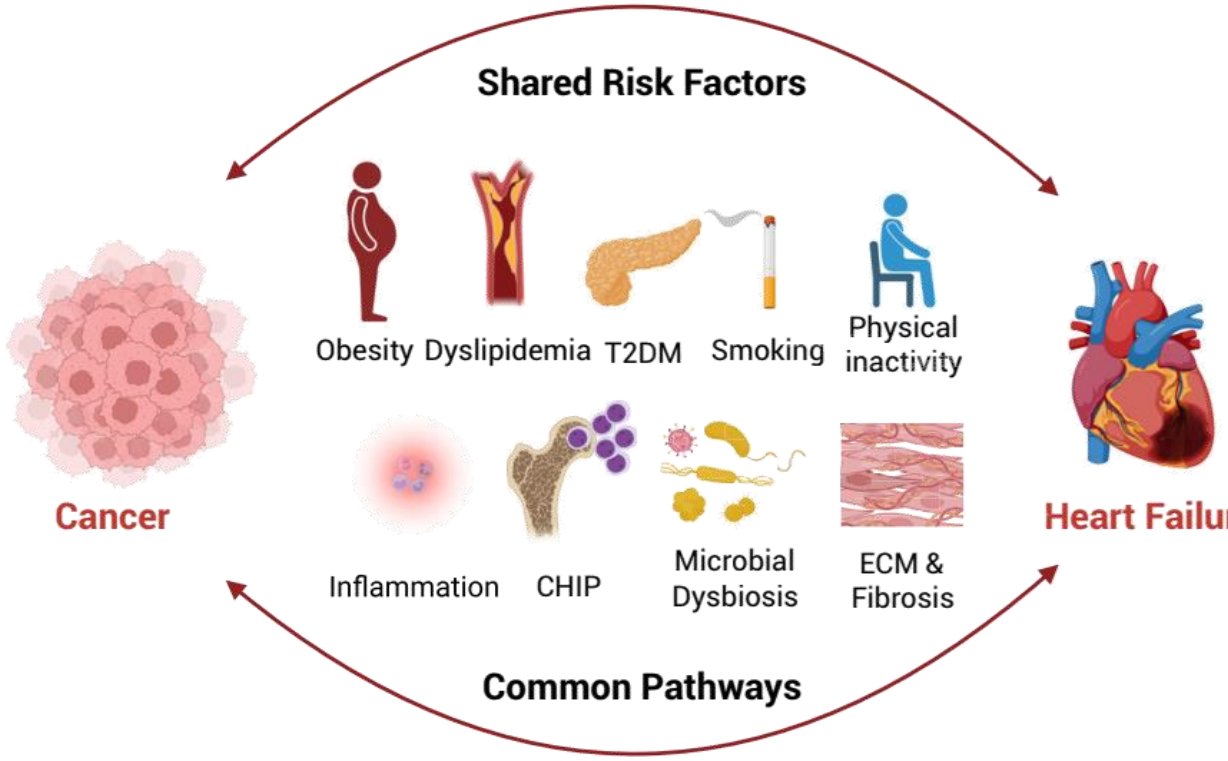


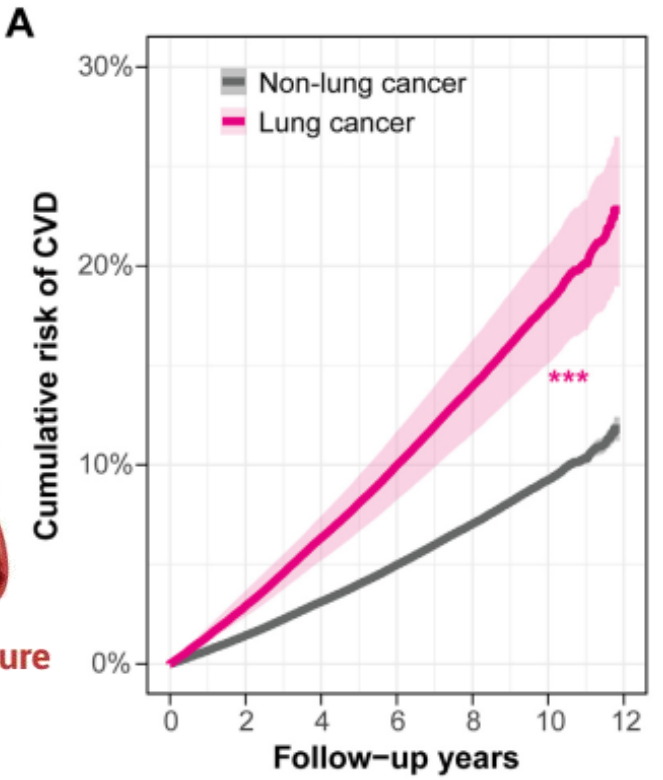
Cumulative incidence of cancer in the heart failure (HF) cohort and the background population adjusted for death from all causes.

Lancelotti 2020. Cardio-oncology: where do we stand for in Belgium?
Banke 2016. Incidence of cancer in patients with chronic heart failure: a long-term follow-up study

kanker en hartfalen lokken elkaar uit

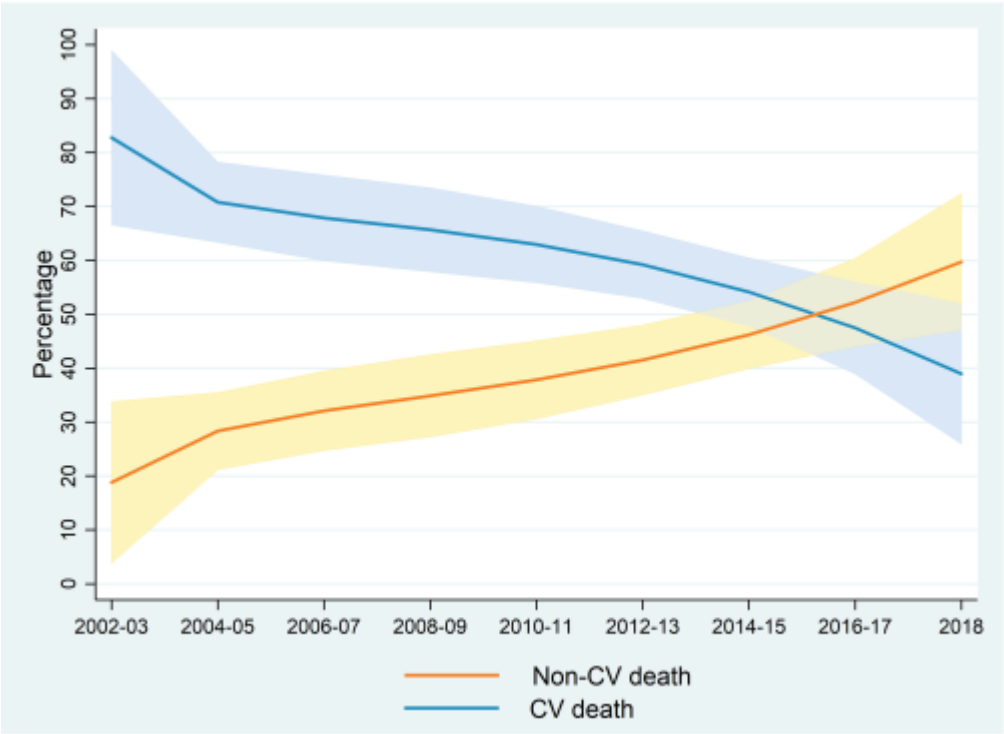




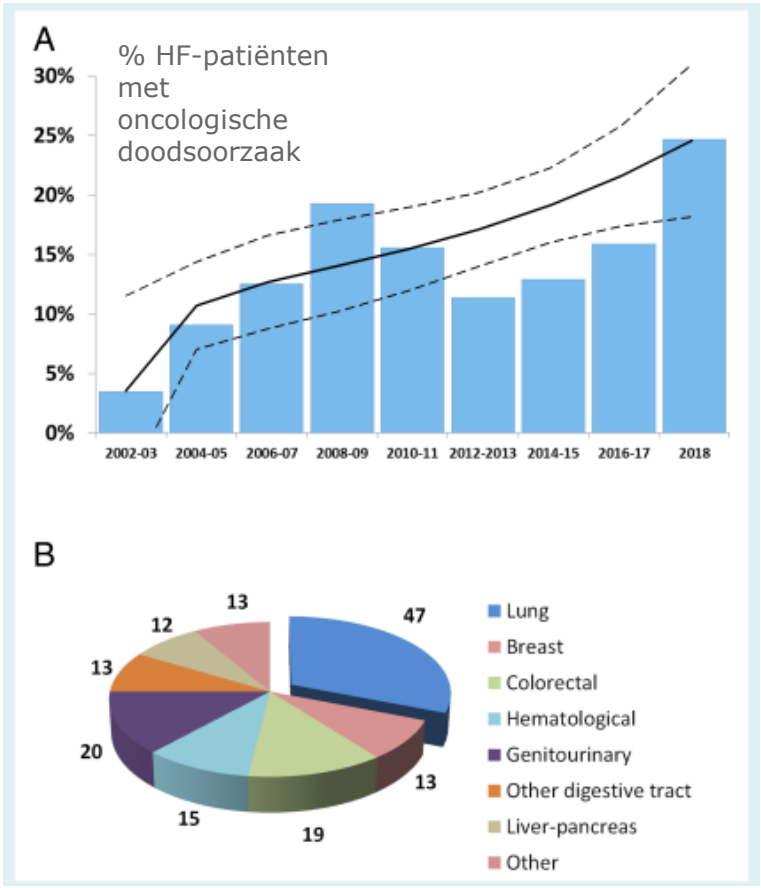


Meijers 2026. Physiol Rev 2026
Zhang 2023. J of Thor Oncol

Doodsoorzaak hartfalenpatiënt



vooral kanker!



Moliner 2019: Trends in modes of death in heart failure over the last two decades

CV event meest frequent na longkanker

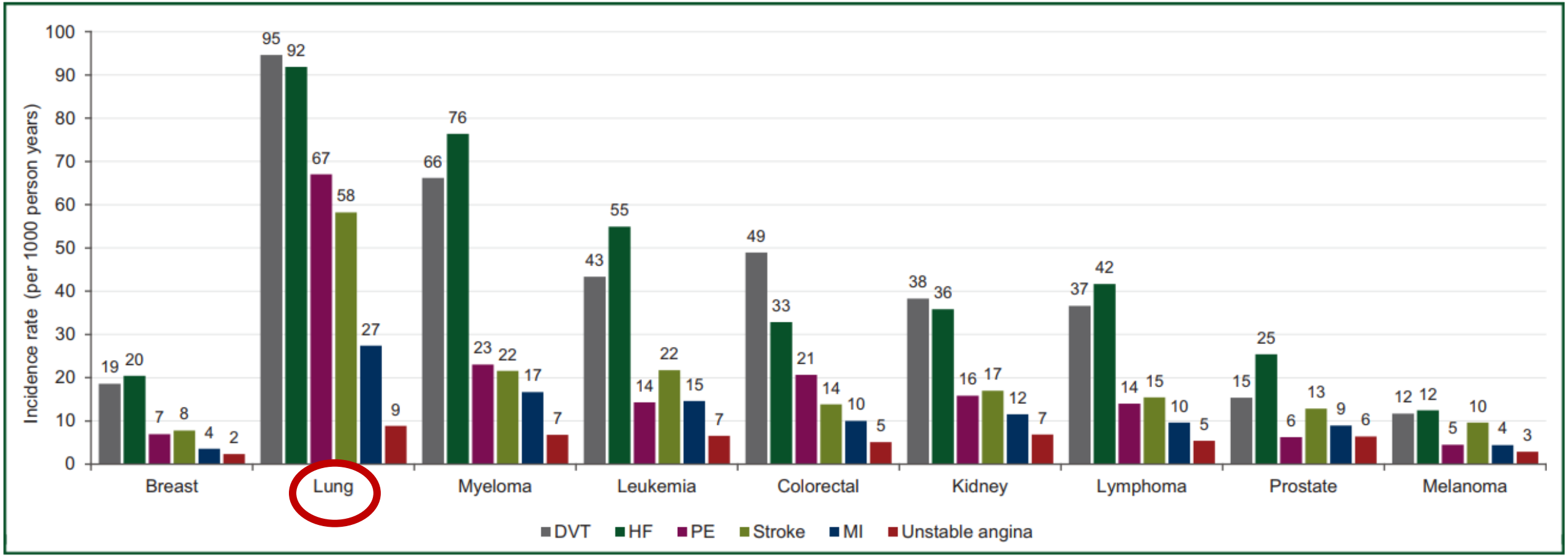
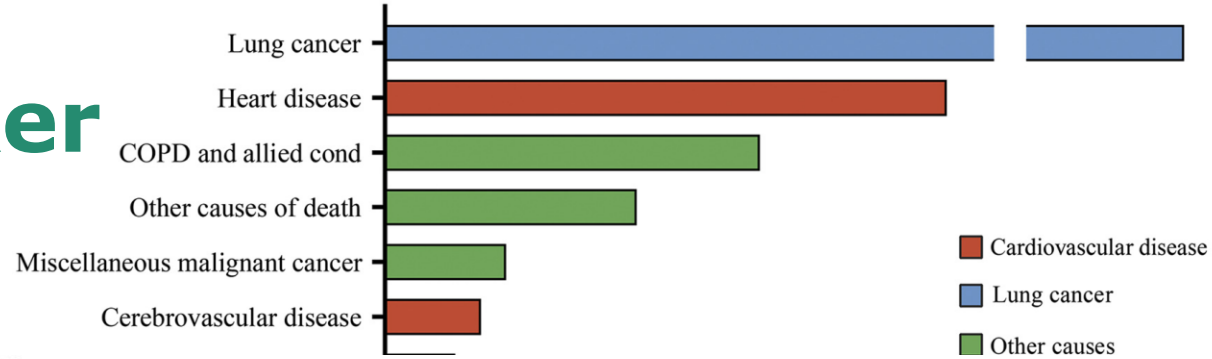
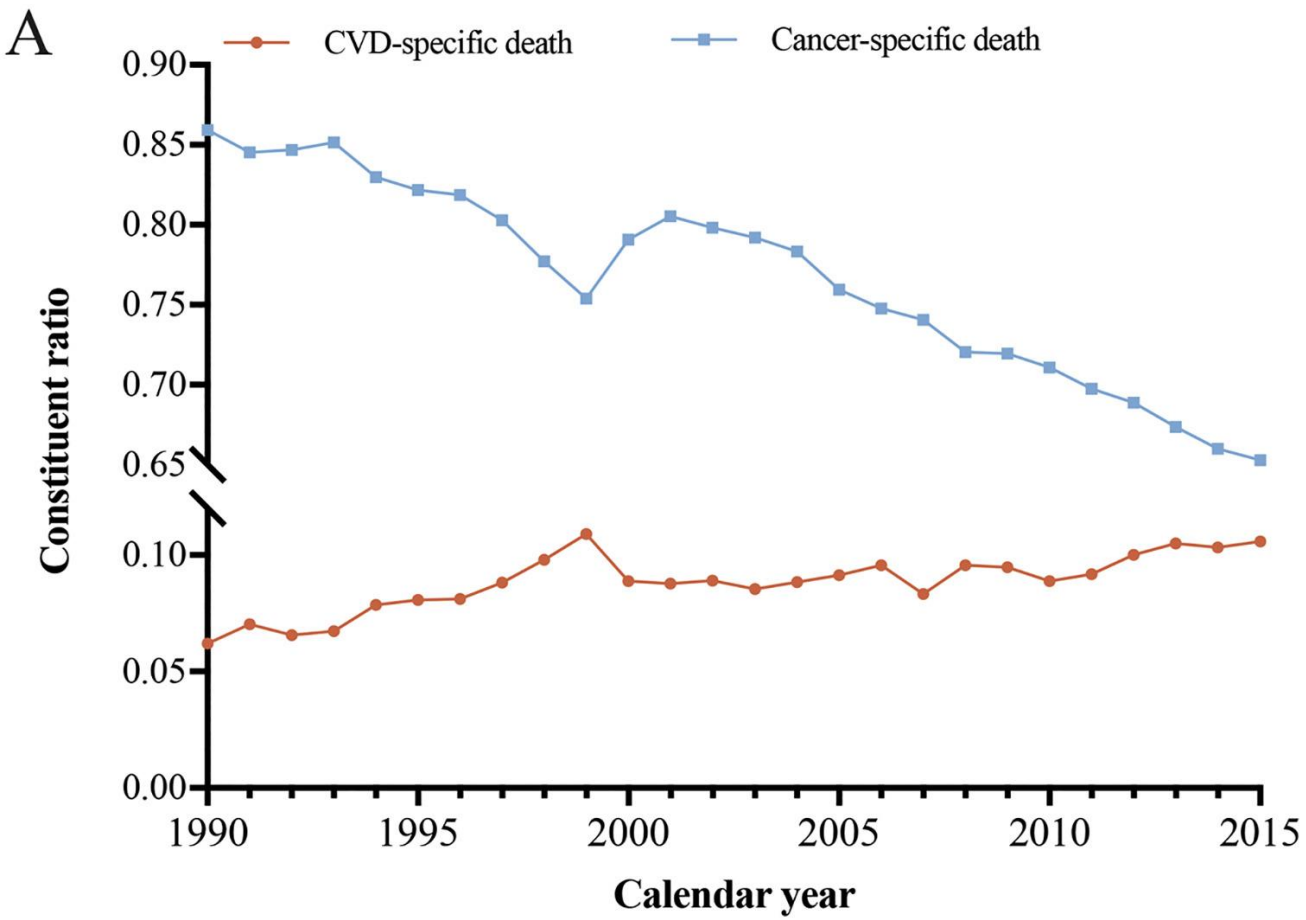


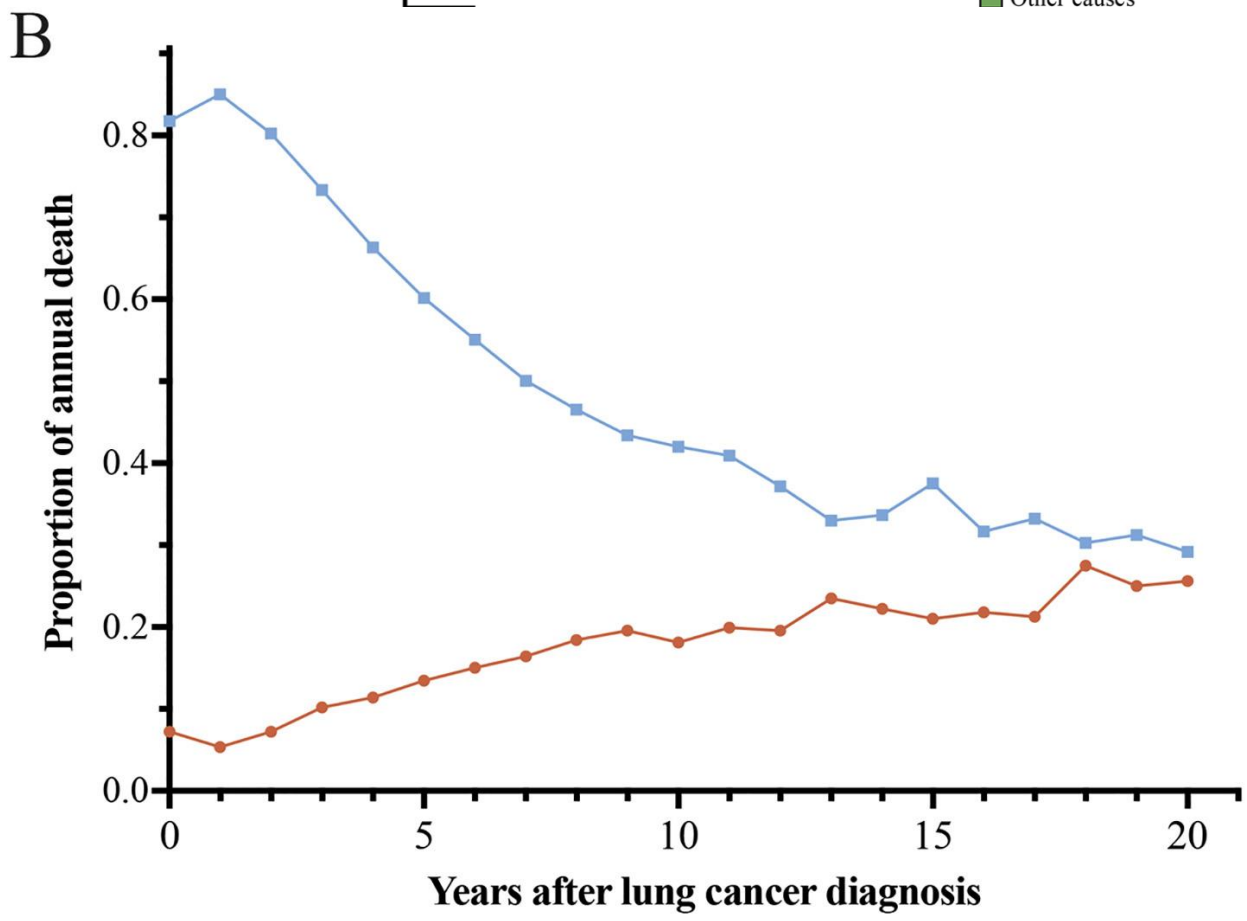
Figure 2. Incidence rate (per 1000 person years) of CV events after cancer diagnosis by cancer type. Incidence rate (%) of CV events per 1000 person years following

Mitchel 2023. ESMO open

mortaliteit bij longkanker





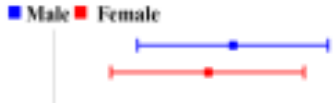


Sun et al. 2021. Cardiovascular disease-specific mortality in 270,618 patients with non-small cell lung cancer. Int J Cardiology

CV aandoening + longkanker = slechtere prognose

Associations of overall and type-specific CVDs with lung cancer mortality in males and females

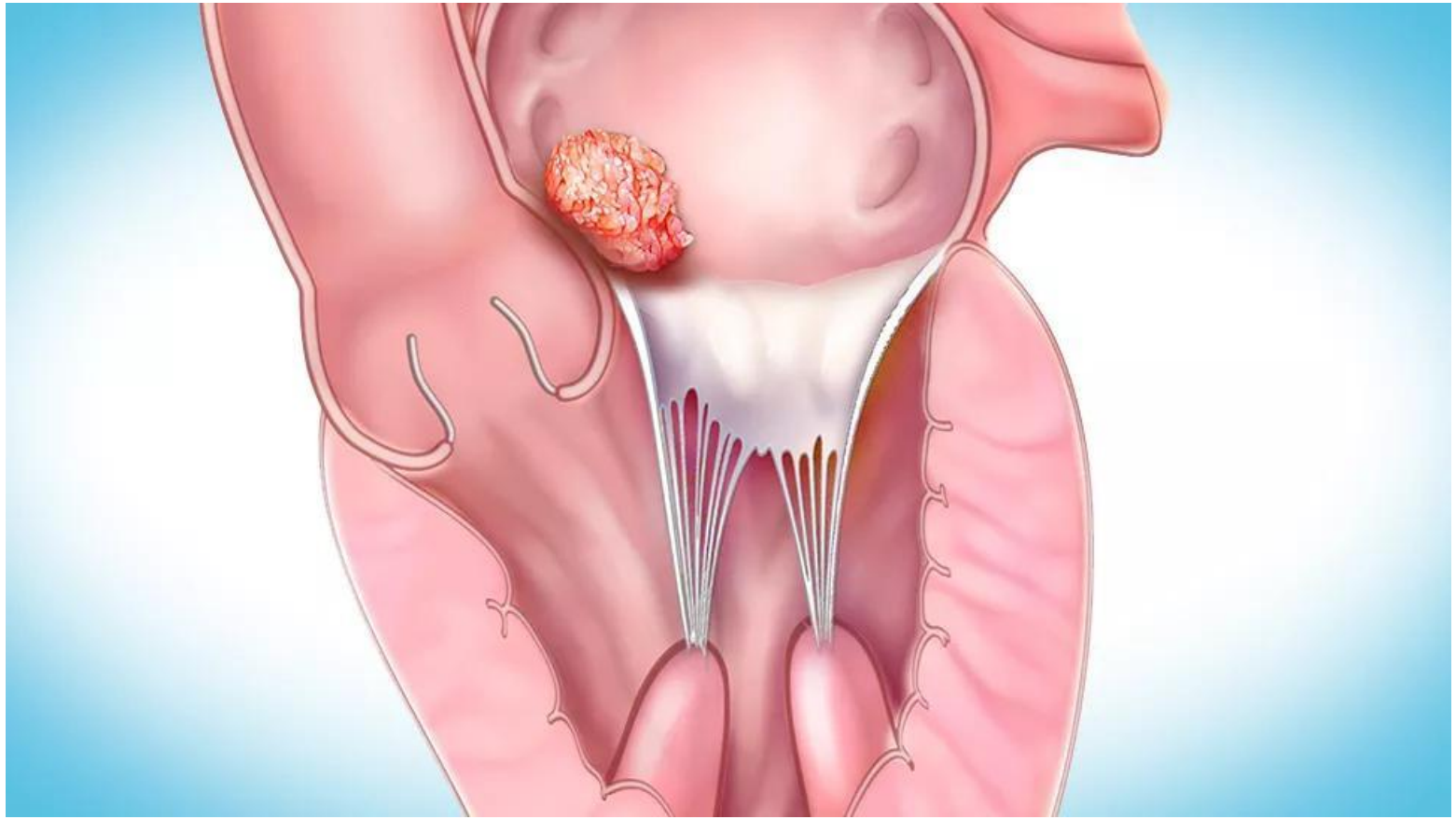
Cardiovascular disease	No. of cases (%) in exposed/unexposed	Rate per 1 million person years in exposed/unexposed	Adjusted hazard ratio (95% CI)	Adjusted hazard ratio (95% CI)	No. of cases (%) in exposed/unexposed	Rate per 1 million person years in exposed/unexposed	Adjusted hazard ratio (95% CI)
				Male Female			
Overall CVD	47 (0.03)/90 (0.02)	32.81/15.61	2.03 (1.39 - 2.96)		51 (0.03)/91 (0.01)	26.25/11.68	1.84 (1.25 - 2.69)



Wang 2022. Front in Oncol

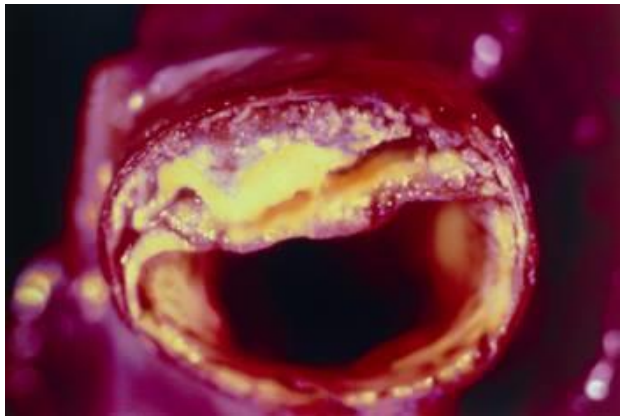
zeker niet

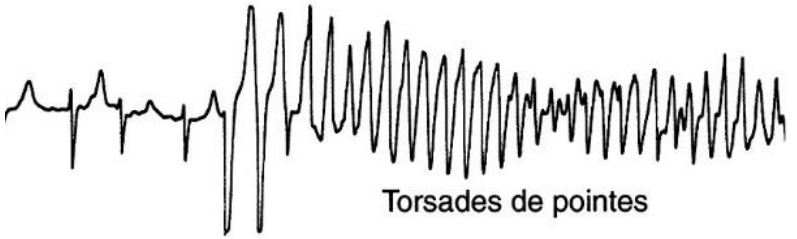
kanker van het hart

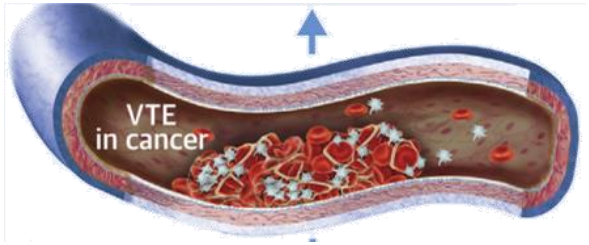


méér dan hartfalen

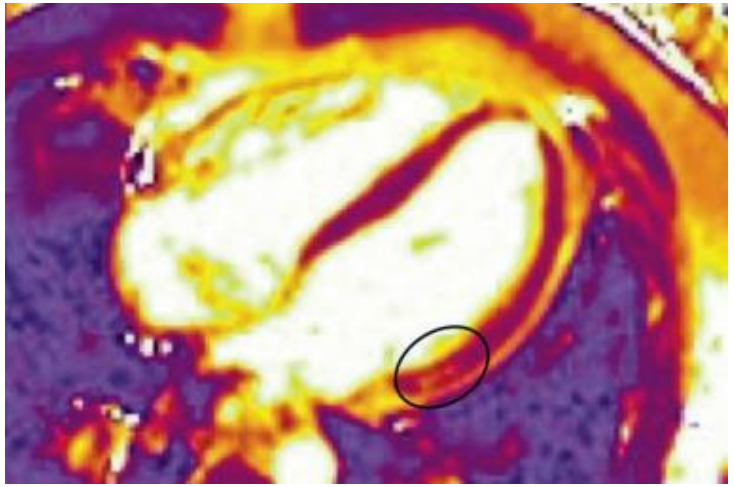






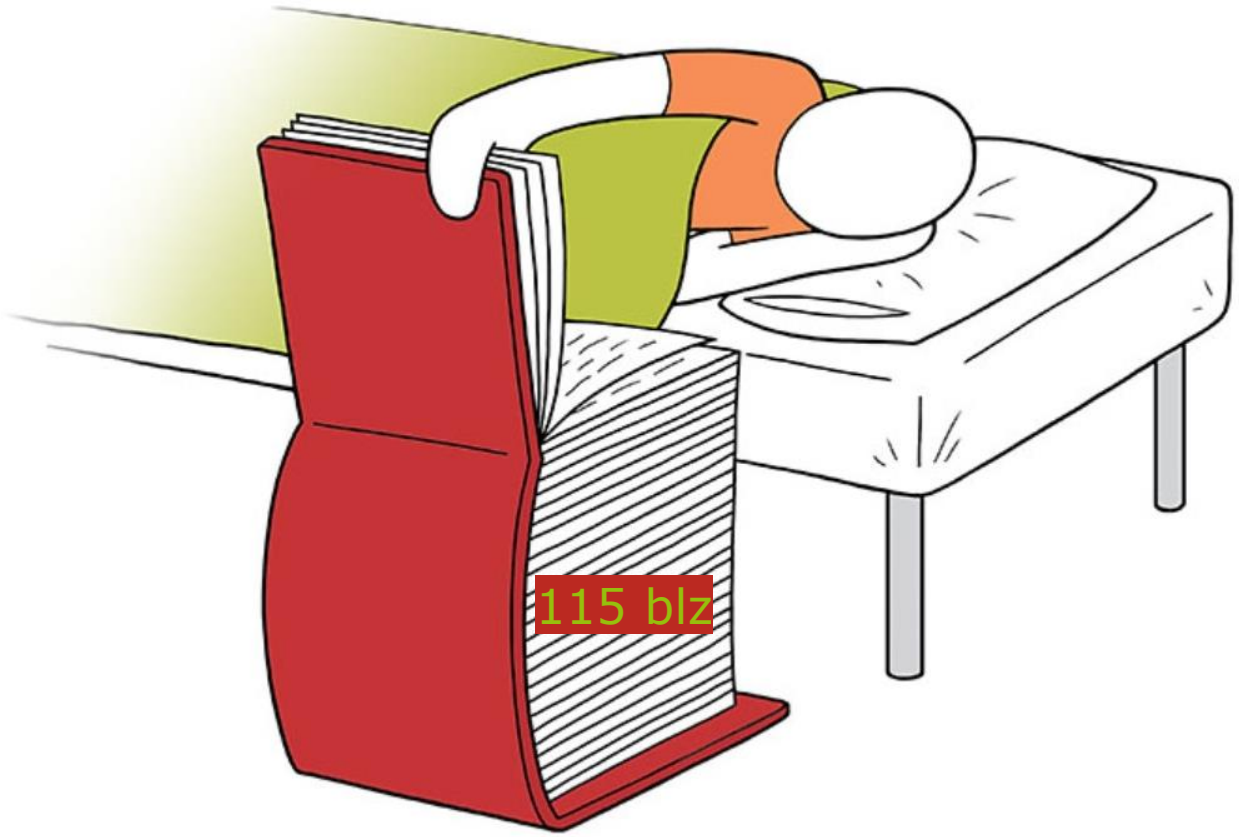






Anker 2020. What do patients with heart failure die from?
Basso et al. Myocarditis. NEJM 2022

2022 guidelines on cardio-oncology



ESC European Society of Cardiology

European Heart Journal (2022) **43**, 4229–4361
https://doi.org/10.1093/eurheartj/ehac244

ESC GUIDELINES

2022 ESC Guidelines on cardio-oncology developed in collaboration with the European Hematology Association (EHA), the European Society for Therapeutic Radiology and Oncology (ESTRO) and the International Cardio-Oncology Society (IC-OS)

Developed by the task force on cardio-oncology of the European Society of Cardiology (ESC)

doel: betere klinische resultaten

- systematische screening vooraf



  - risico-inschatting
  - gepersonaliseerd opvolgingsschema
  - educatie



- ‘pre-chemo-consult’ bij hoogrisicopatiënt
  - optimaliseren van voorafbestaande CV aandoeningen en risicofactoren
  - gepersonaliseerd opvolgingsschema



- behandeling van kankertherapie-gerelateerde CV problemen
    - vroege diagnose dankzij systematische opvolging en bewustwording



- cardiologie ten dienst van de oncologische behandeling
  - therapie-onderbrekingen ↓
  - behandelingen met groter CV risico ↑



vooraf

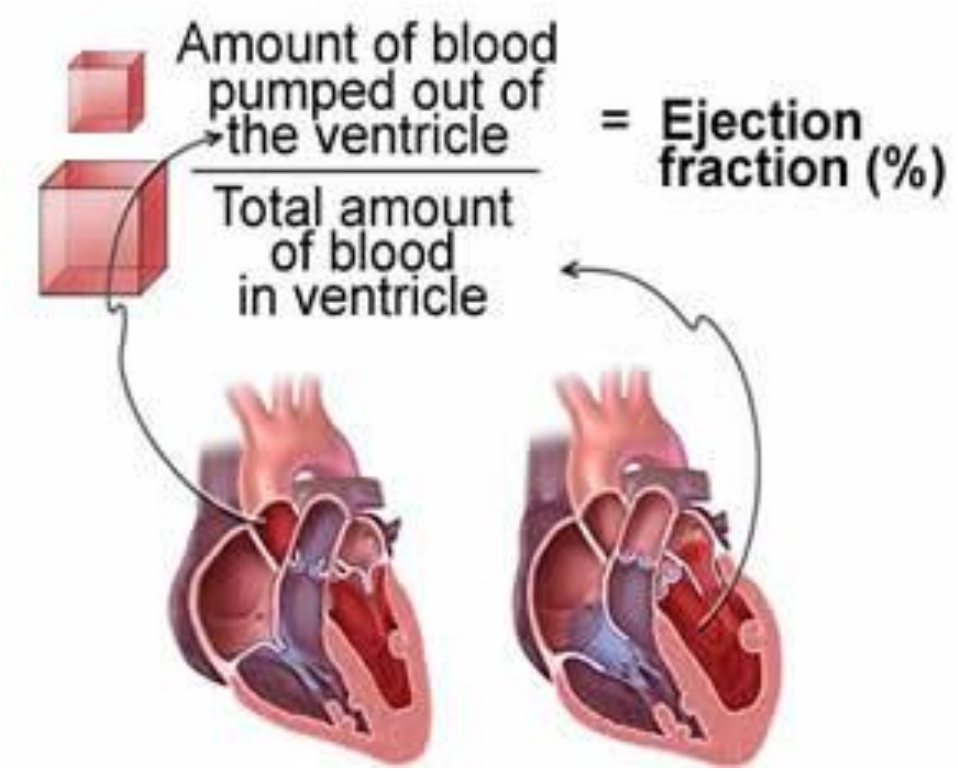
CARDIOLOGISCHE BEELDVORMING

linkerventrikel-ejectiefractie (LVEF)

SV

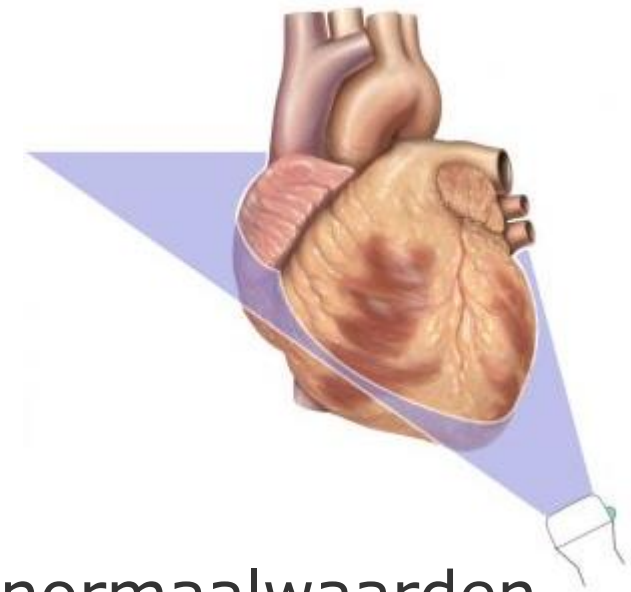
———

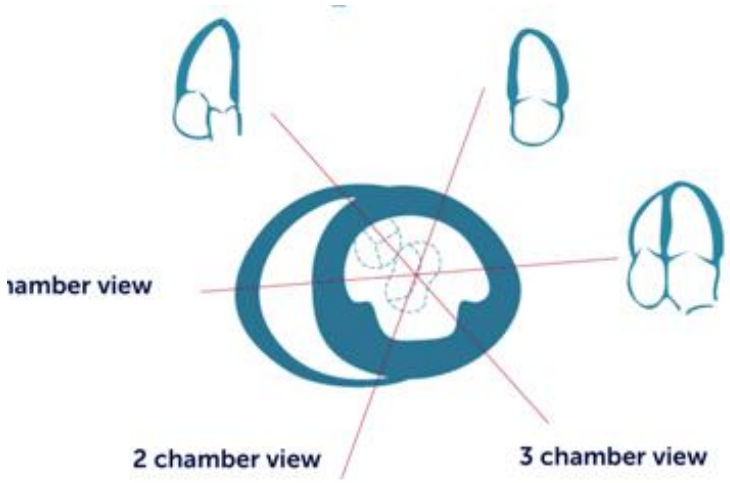
EDV





bepalen LVEF

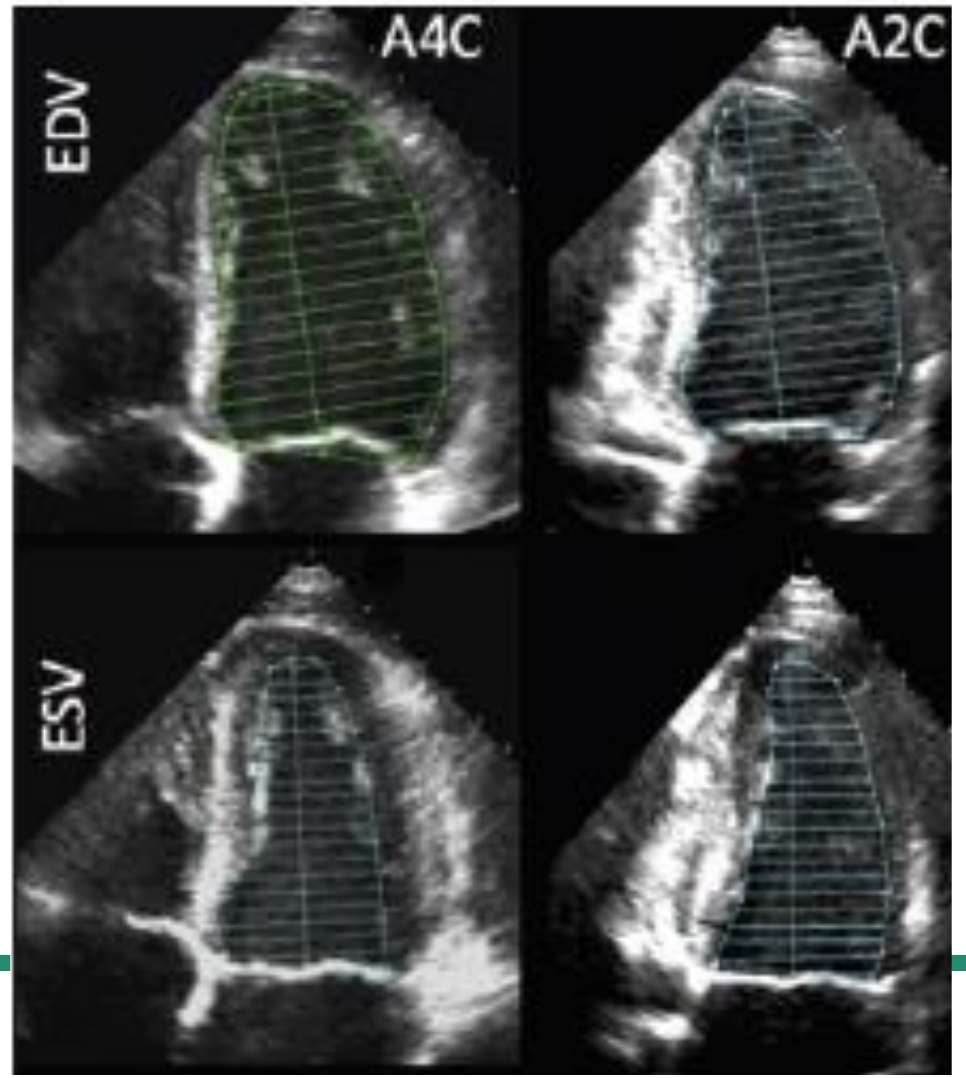




normaalwaarden

- nl: 52% of hoger (man)
  54% of hoger (vrouw)
- licht: 41-51 of 41-53%
- matig: 30-40%
- ernstig: <30%

biplane Simpson = integratie van A4C en A2C



Lang et al. Chamber quantification. JASE 2015

systolische functie LV

3. LVEF varieert

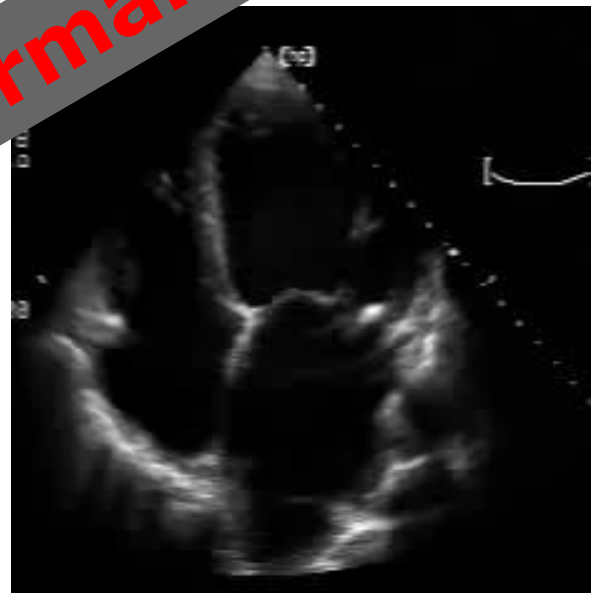
interobserver: 10%
intraobserver: 10%
tijd (o.a. afterload)

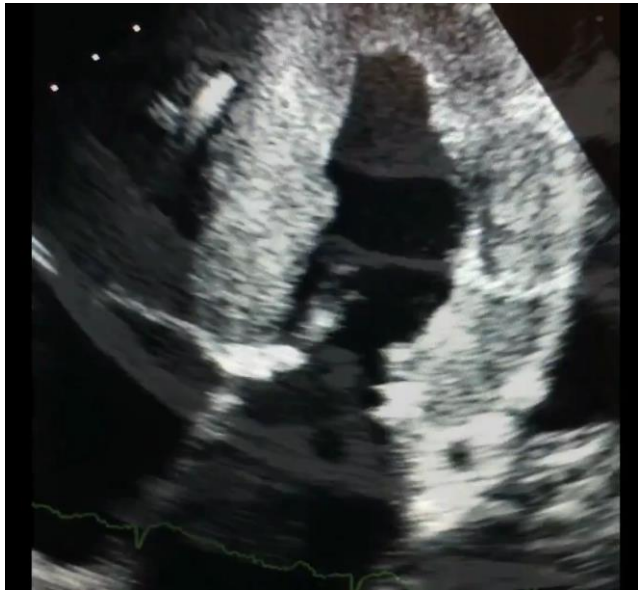
1. Niet de hele LV wordt bekeken



! normale EF ≠ normale sytolische functie !

Abnormaal slagvolume of ziek myocard kan normale LVEF hebben





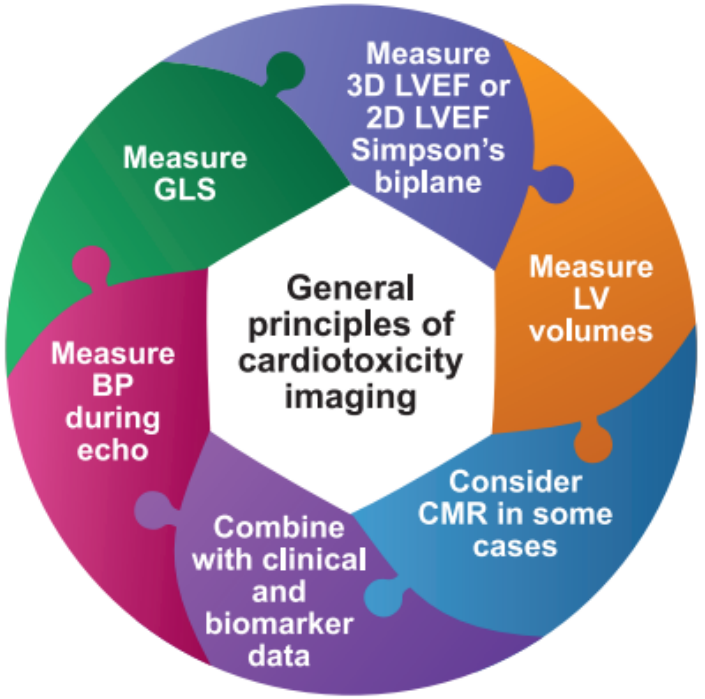
Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

LVEF

"Decision-making (…) should no longer rely solely on LVEF, which mainly reflects changes in LV volumes, rather than function."

- 3D
  - minder variatie
  - vereist beeldkwaliteit
    - radiotherapie – mastectomie – prothese – cachexie - …
- echo-contrast (Sonovue®)
- MRI
  - kostprijs en beschikbaarheid
  - 4% variabiliteit
- MUGA (multigated acquisition scan): radioactieve belasting

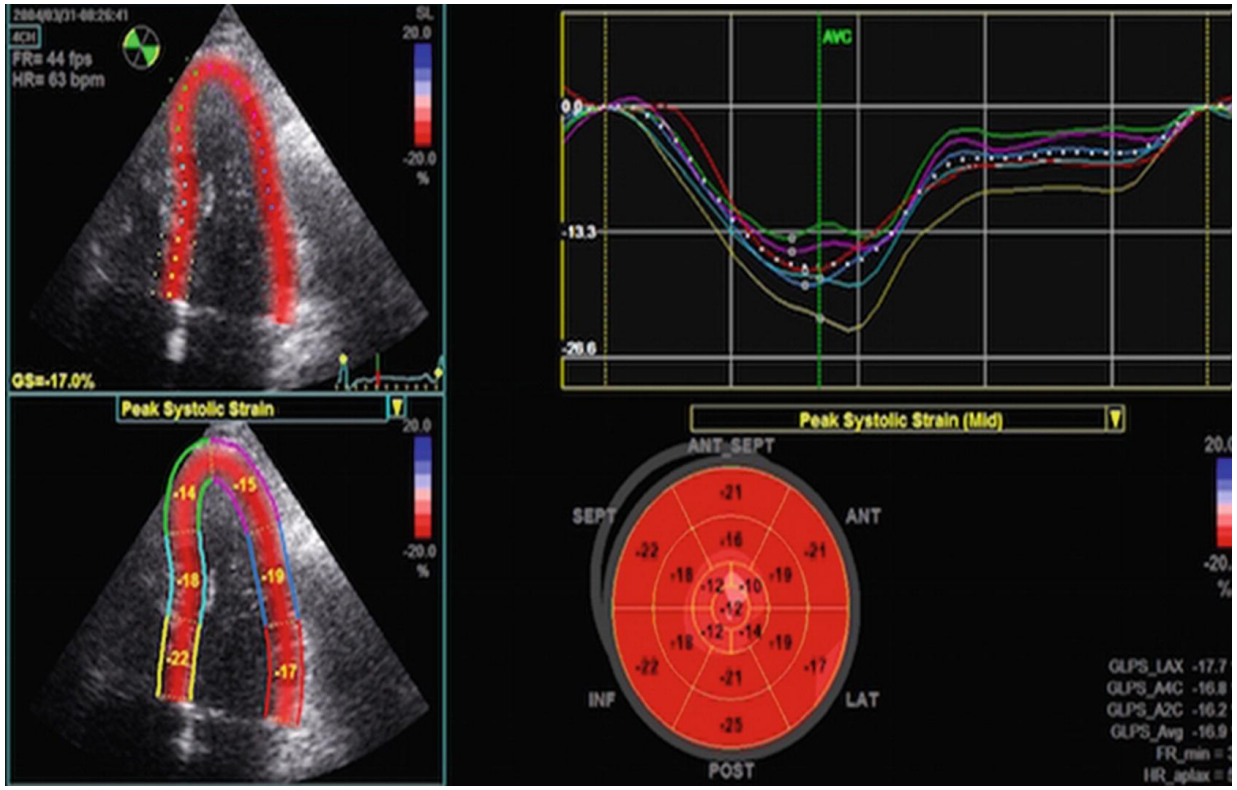




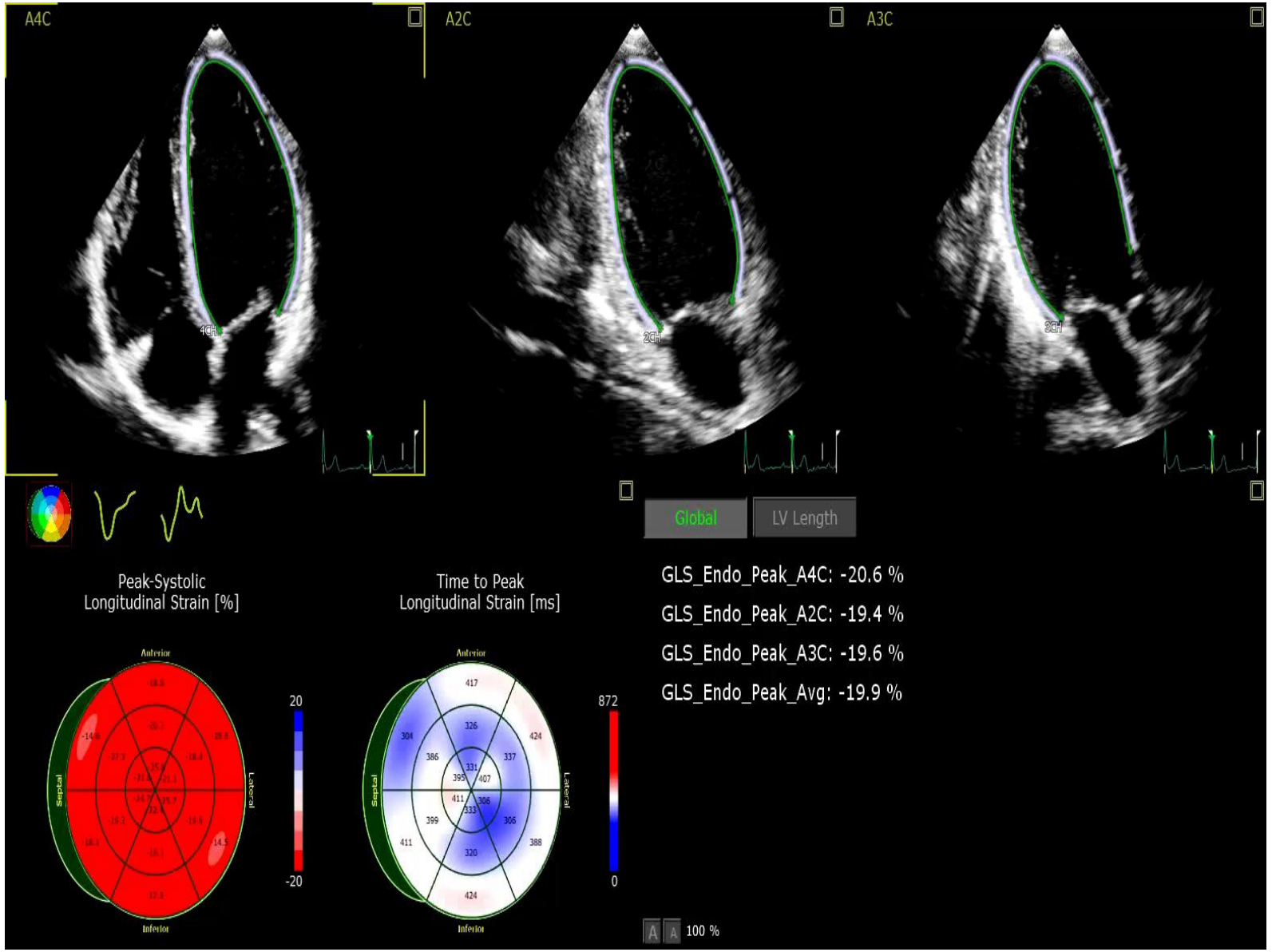
Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

GLS: globale longitudinale strain

- verkorting van het myocard in de longitudinale richting
- normaal: negatiever dan -16% (-16% tot -18%: grijze zone)
- gevoeliger dan LVEF

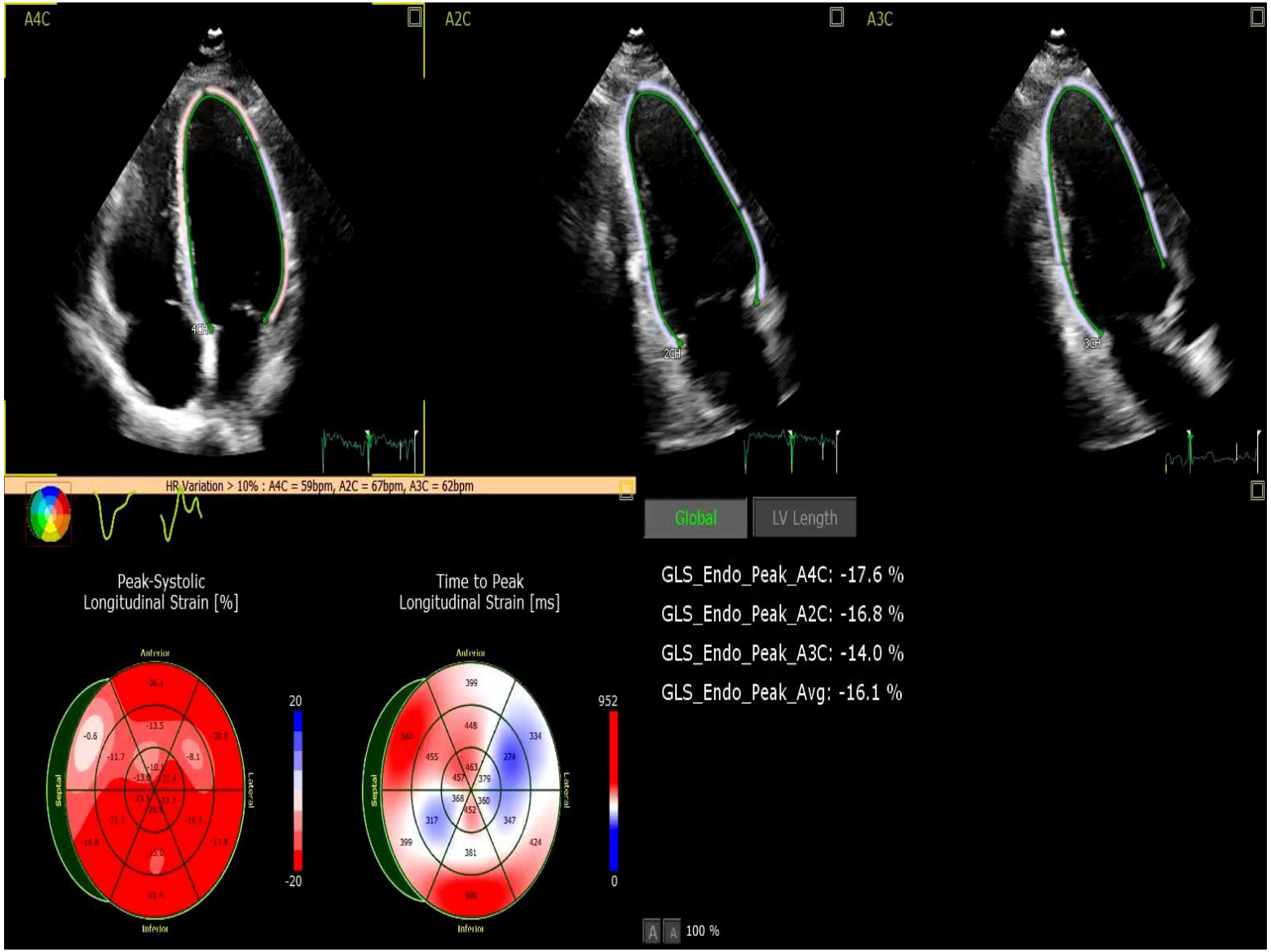


- baseline
- normaal



Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

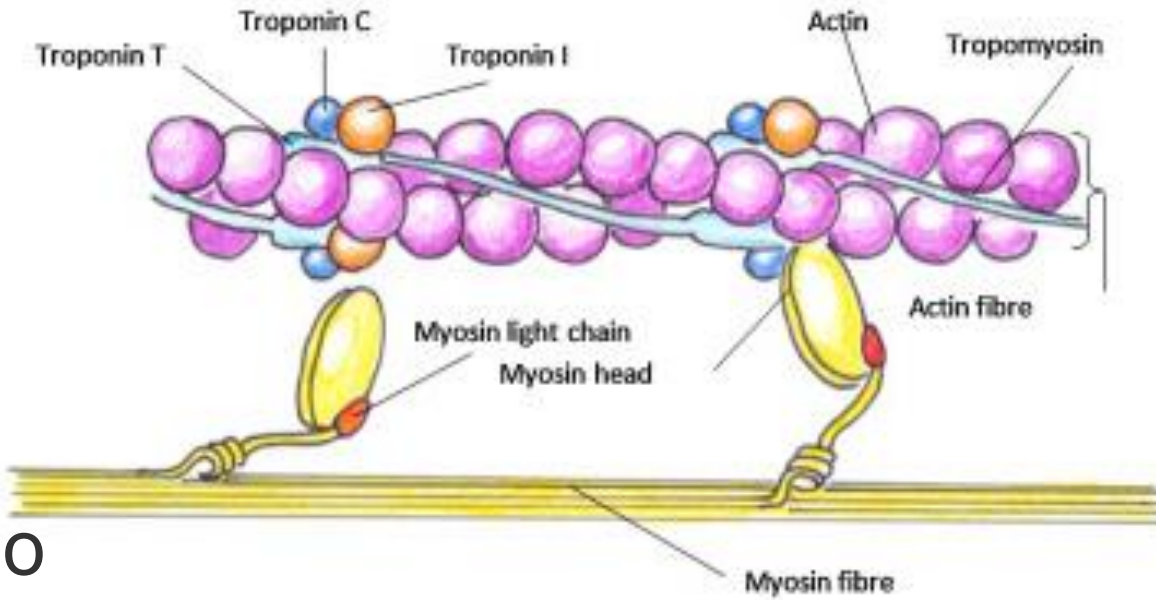
- na AC + Trastuz. + RT
- GLS -19,9% --> -16,1%
- (= daling van 19%)



Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

biomarkers

- expert opinion
- Tn (of NT-proBNP) opvolgen ifv baseline risk en soort chemo

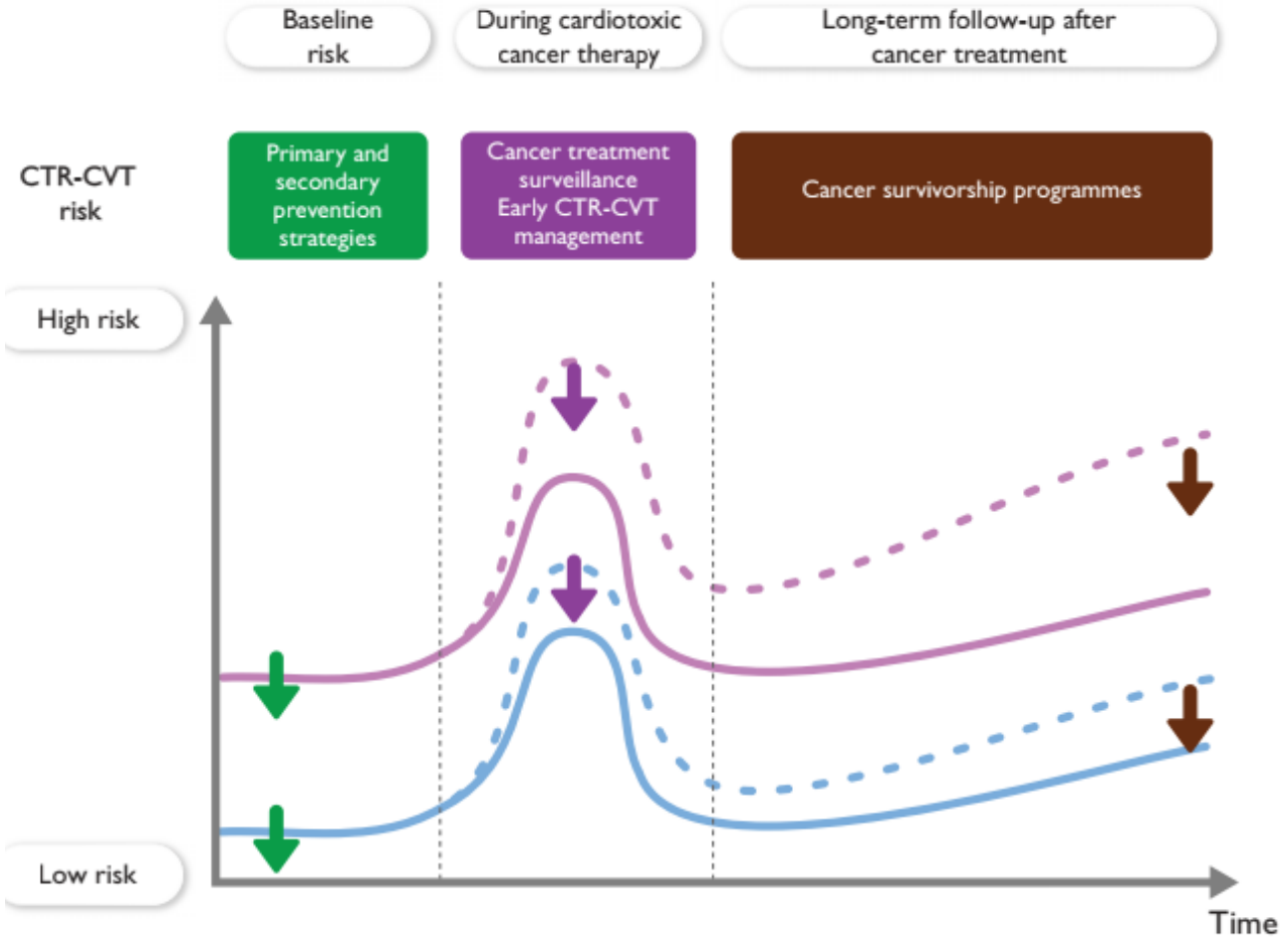


- hsTn I (en T)
  - ~ myocardial injury (cardioseleief)
  - ~ prognose

verminderde excretie + rechtstreekse myocardiale toxiciteit

Tn-stijging klassiek myocardinfar
myocarditis
longembolen
hartfalen / cardiomyopathie
heelkunde; trauma
aortadisseie
sepsis, SIRS, brandwonden, …
nierinsufficiëntie

HET TRAJECT



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

If you change nothing, nothing changes

PREVENTIE EN PRECHEMO-CONSULT

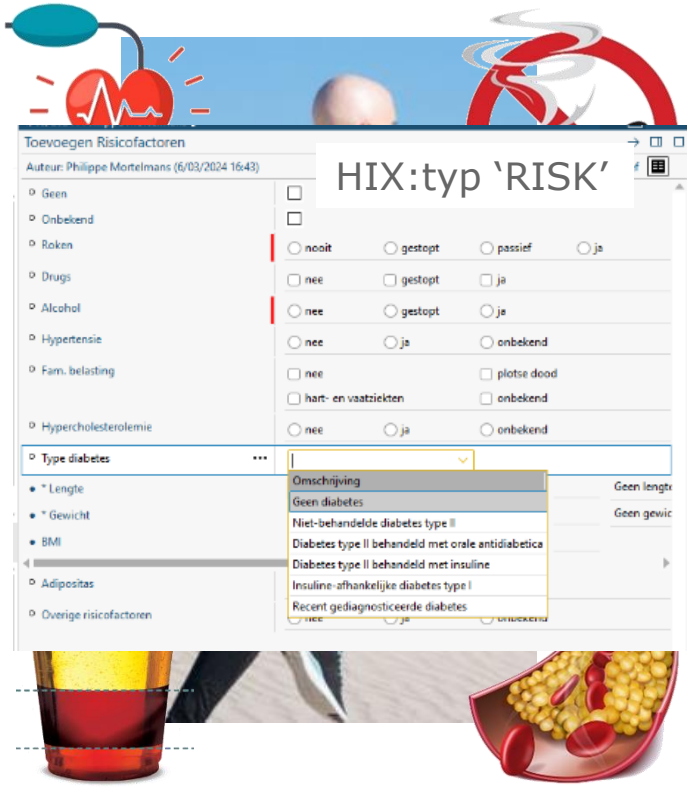
Preventie: bij iedereen

Management of CVD and CVRF according to ESC Guidelines

In patients at high and very high risk of CTRCD

huisarts + pneumoloog + cardioloog

- ‘optimalisatie’ bestaande pathologie
- opstellen opvolgingsplan



HIX:typ ‘RISK’

baseline CV risico-inschatting

- systematisch bij **elke** patiënt met cardiotoxische behandeling
- verwijs de **hoog en zeer hoog** risico

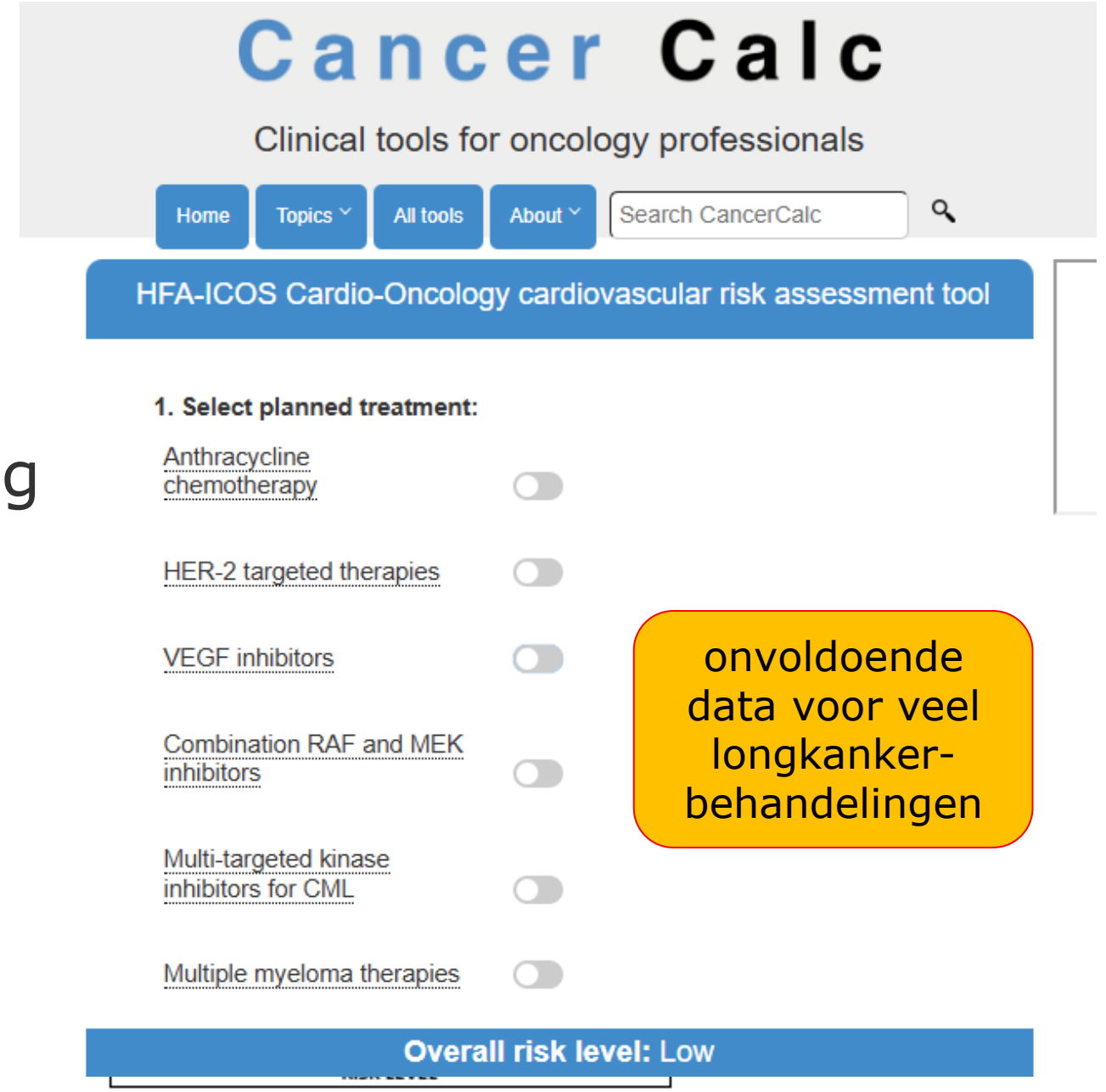
Lyon et al. Baseline cardiovasculair risk assessment in cancer patients. Eur J Heart Fail 2020

categorieën

klasse-specifiek schema

--> laag/medium/hoog/zeer hoog

- 5 klassieke risicofaoren
  (AHT – chol – roken – DM – obesitas)
- CV en oncologische voorgeschiedenis
- Tn en NT-proBNP
- type behandeling



onvoldoende data voor veel longkanker-behandelingen

Lyon et al. Baseline cardiovasculair risk assessment in cancer patients. Eur J Heart Fail 2020

focus

ARTERIËLE HYPERTENSIE

hypertensie

- frequent (~40%)
- relevant (mortaliteit)
- meten! – zo nodig ook thuis
- oorzaken
  - voorafbestaande AHT
    - optimaliseer voor opstart onco-therapie
  - stress, pijn, alcohol, sedentair
  - nierinsufficiëntie
  - kankermedicatie
  - adjuverende medicatie (corticoïden, NSAID, EPO)

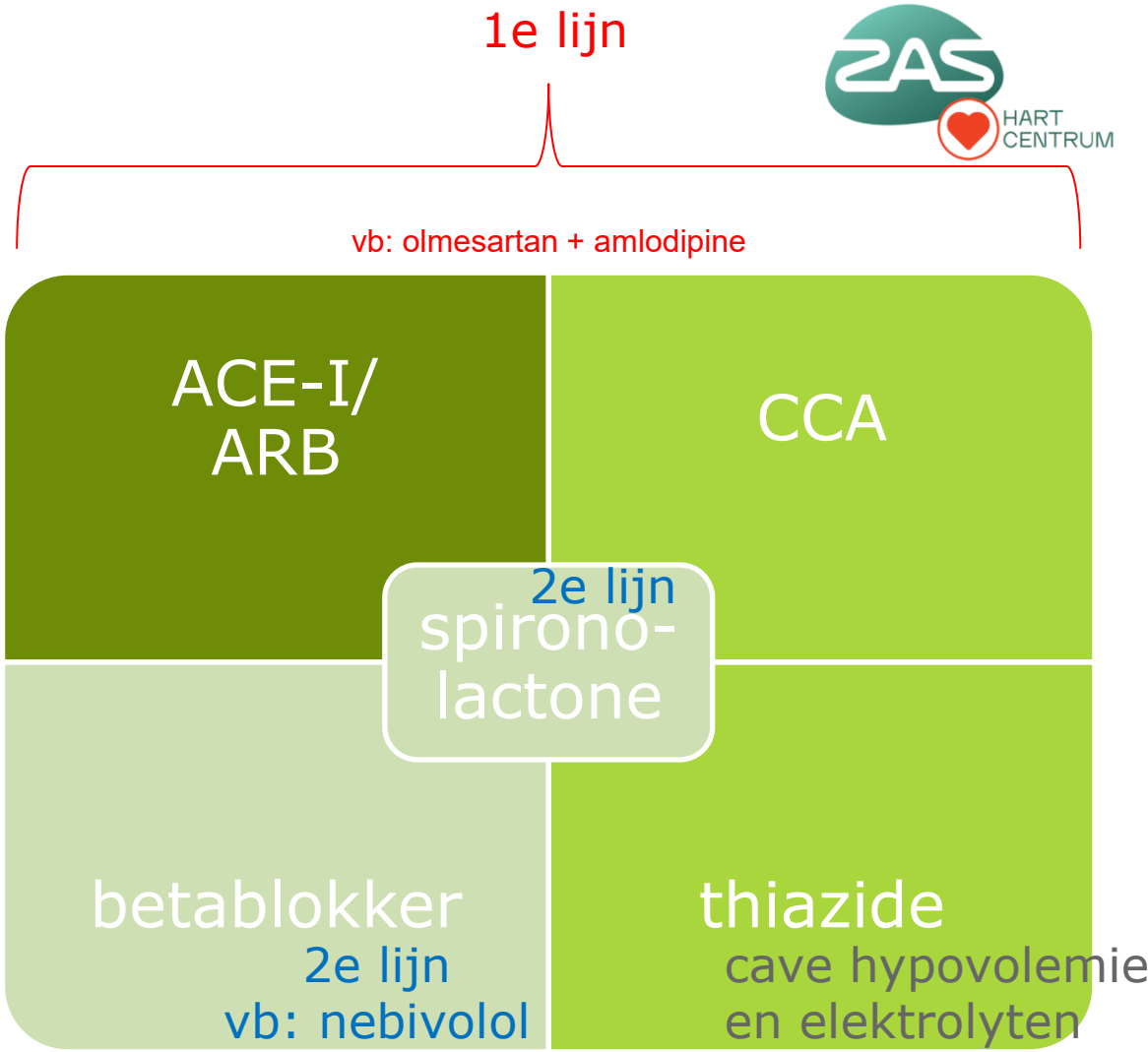
Kankermedicatie met AHT-risico

Drug Class	Agents
VEGF pathway inhibitors (VEGFi)	***Bevacizumab***, *aflibercept, ramucirumab*
Multitargeted tyrosine kinase inhibitors (TKIs) with VEGF inhibition	*Sunitinib, sorafenib, pazopanib, axitinib, lenvatinib, cabozantinib*
BCR-ABL tyrosine kinase inhibitors	*Imatinib, dasatinib, nilotinib, ponatinib, bosutinib*
BRAF inhibitors / MEK inhibitors	*Vemurafenib, dabrafenib / trametinib, cobimetinib*
ALK inhibitors	*Crizotinib, alectinib, brigatinib, lorlatinib*
Proteasome inhibitors	*Carfilzomib, bortezomib*
Bruton tyrosine kinase (BTK) inhibitors	*Ibrutinib, acalabrutinib, zanabrutinib*
Fluoropyrimidines	*5-fluorouracil (5-FU), capecitabine*
Platinum compounds	*Cisplatin, carboplatin, oxaliplatin*
Alkylating agents	*Cyclophosphamide, ifosfamide*
Aromatase inhibitors	*Anastrozole, letrozole, exemestane*
Androgen receptor pathway inhibitors (ARPI)	*Abiraterone, bicalutamide, enzalutamide*

cave: AHT is reversibel => rebound hypotensie na stoppen chemo

behandeling

- geen RCT's => kies o.b.v. comorbiditeiten
- doel: **< 140/90mmHg** (**< 130/80mmHg** als goed verdragen)
  - hou rekening met prognose
- als **>180/110 mmHg** : causale therapie uitstellen



focus

HYPERCHOLESTEROLEMIE

SCORE2 ('low risk region')

niet voor DM of gekend vaatlijden

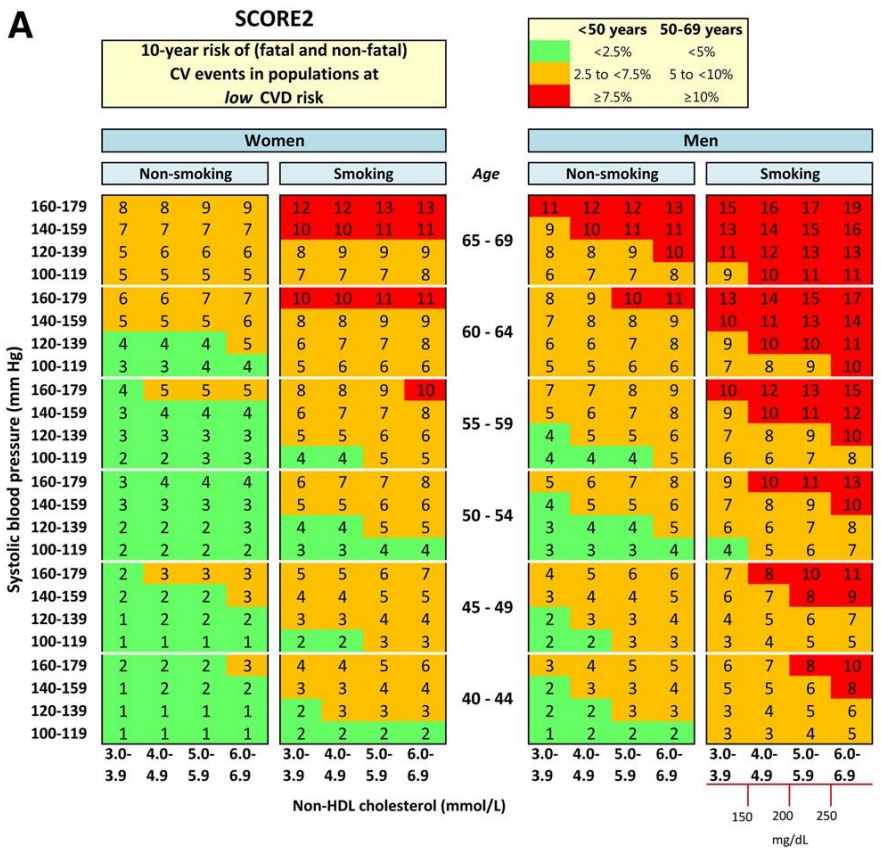
M

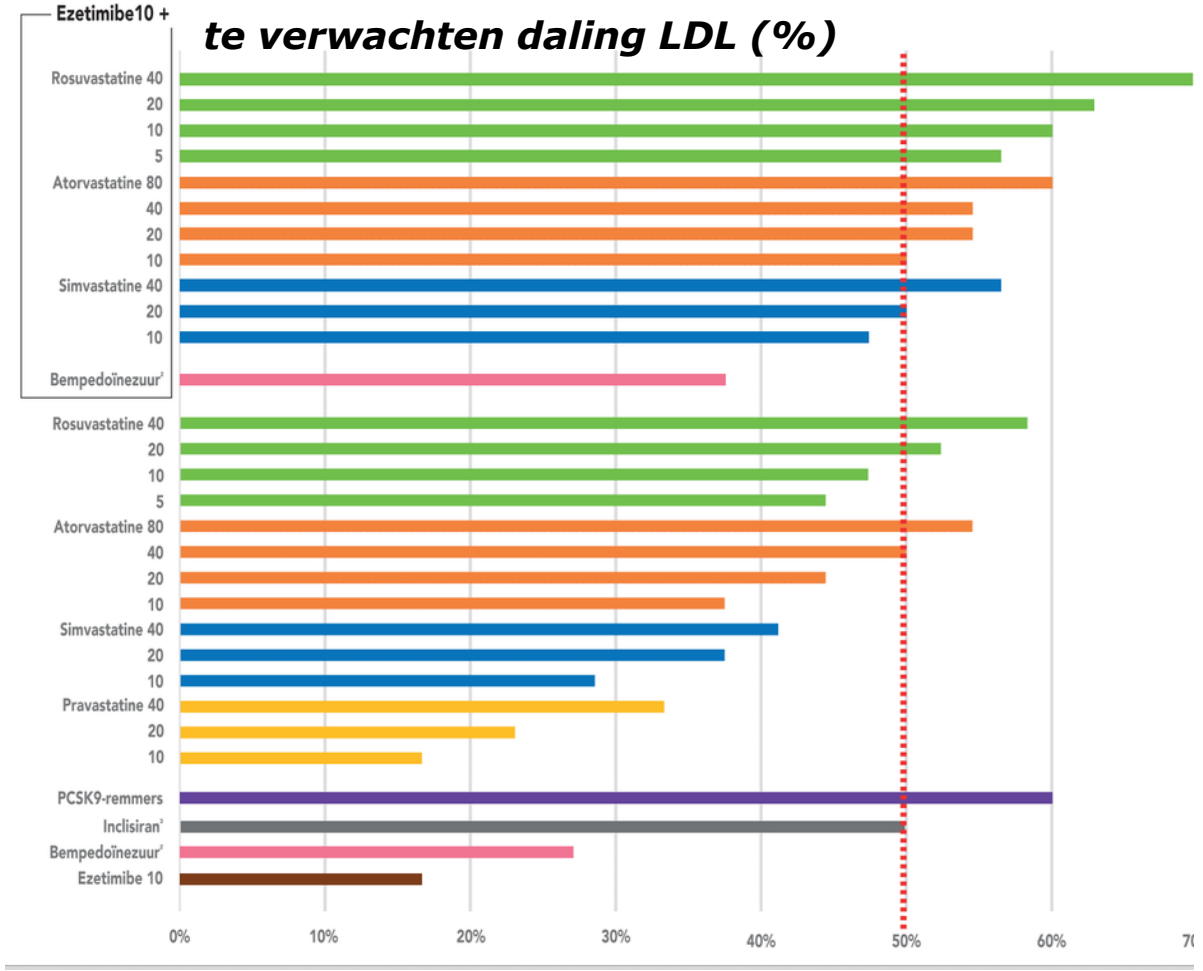
Calculate the 10-year risk of fatal and non-fatal cardiovascular disease events of your patients

doel LDL

<2.6 mmol/L (<100 mg/dL)

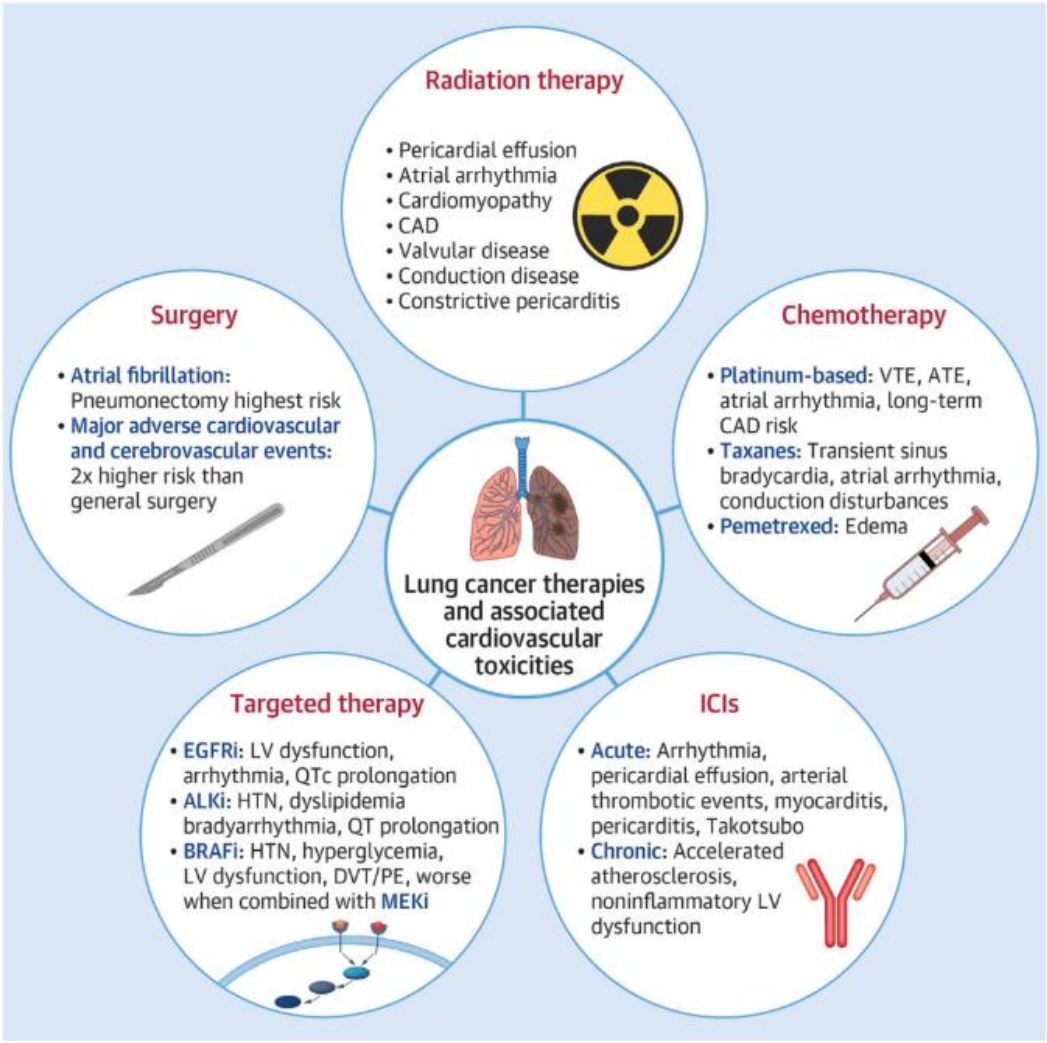
<1.8 mmol/L (<70 mg/dL)





SPECIFIEKE THERAPIEËN

Oncologische behandeling => CV event



El-Rayes M, et al. JACC CardioOncol. 2025;7(4):325-344.

cardiooncology.be

live sinds 9 oktober 2026





thoracale heelkunde

- bij patiënten met betere prognose
- postoperatieve VKF: 10 à 30% => anticoagulatie
- acuut hartfalen (1,6%)
  CV mortaliteit (1,2%)
  myocardinfarct (0,5%)

CHA_2DS_2-VA score and stroke risk in Atrial fibrillation



CHA_2DS_2-VA score

C	Chronic heart failure	1
H	Hypertension	1
A	Age (≥ 75 years)	2
D	Diabetes mellitus	1
S	Stroke	2
V	Vascular disease	1
A	Age (65-74)	1

Annual stroke risk according to CHA_2DS_2-VA score

score	Annual stroke risk (no anticoagulation)	Annual stroke risk (NOAC therapy)
0	0.5%	0.2%
1	1.5%	0.5%
2	2.9%	1.0%
3	5.1%	1.8%
4	7.3%	2.6%
5	11.2%	3.9%
6	15.5%	5.4%
7	14.7%	5.1%
8	19.5%	6.8%

Oral anticoagulation (NOAC or warfarin)

NOAC – Apixaban, Rivaroxaban, Edoxaban, Dabigatran

Peter Blahut, MD

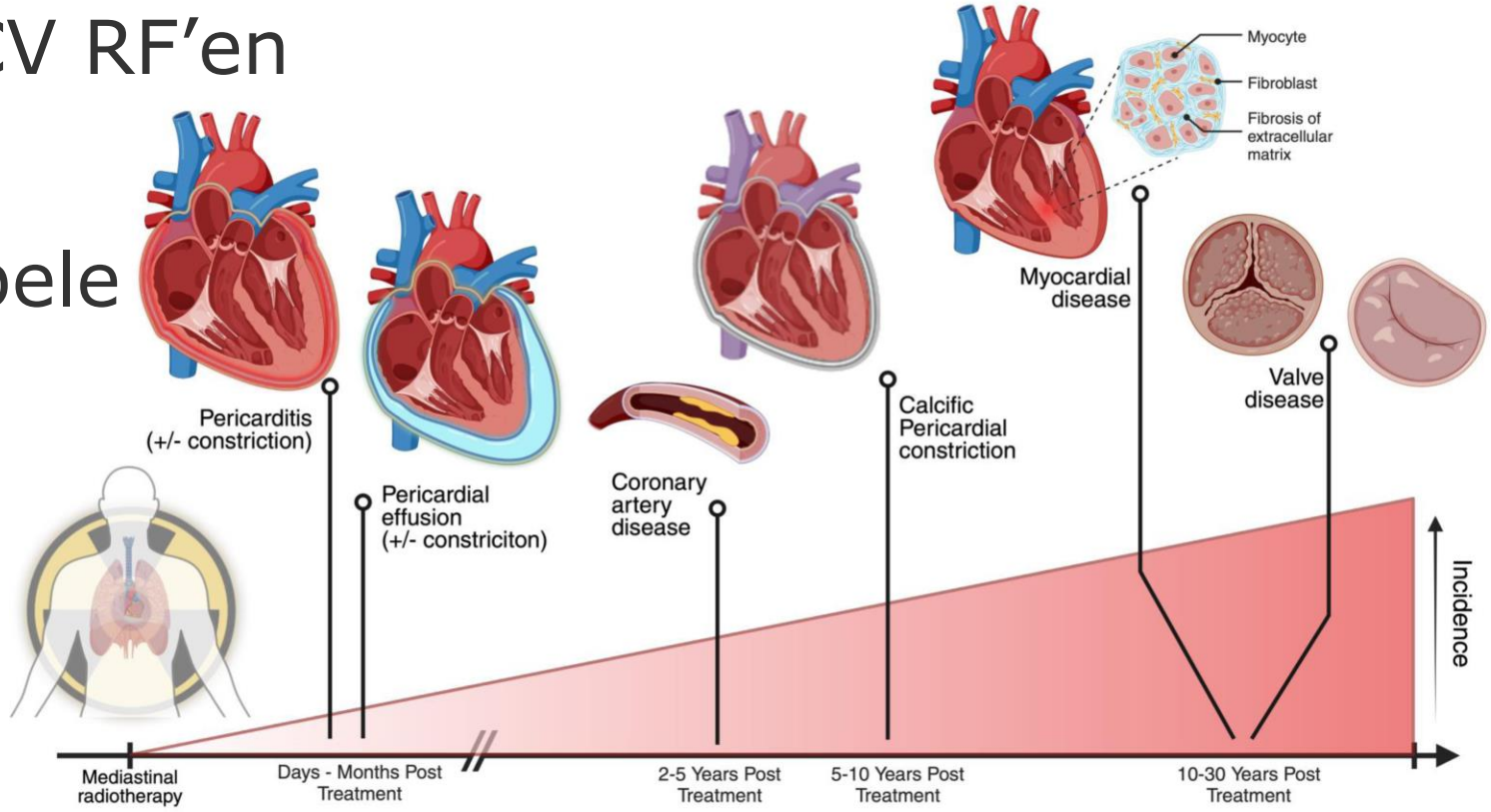
Yegya-Raman 2023. Curr Onc Reports

radiotherapie

- schade ~ mean heart dose

  ~ klassieke CV RF'en

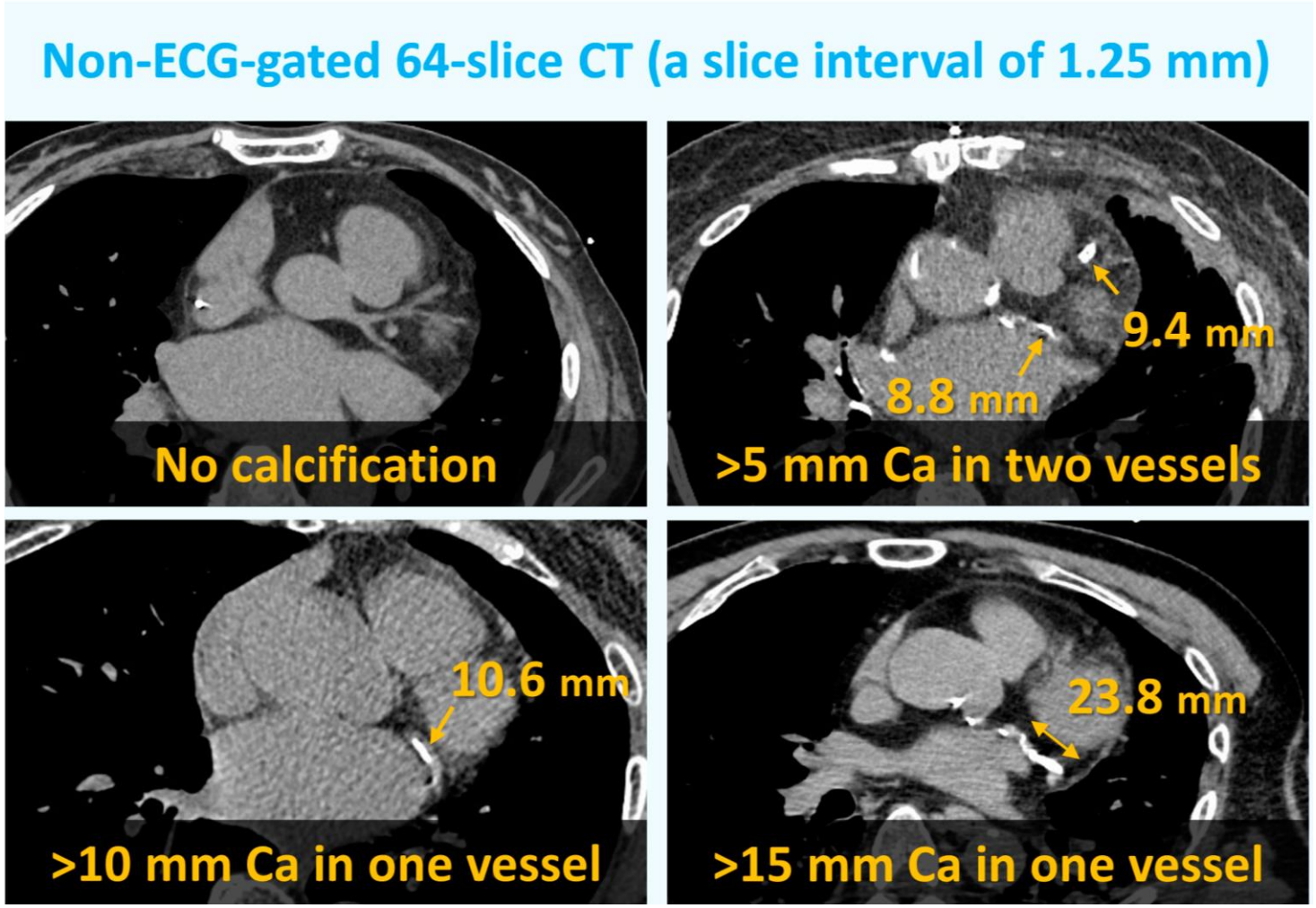
- ook bij CV niet-operabele longkankerpatiënt



Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail
Wilson 2025. Circulation: Cardiovascular Imaging

radiotherapie - coronair

Ca^{2+}-score nuttig,
ook van non-gated CT
(staging)



Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail
Watanebe 2024. J Clin Med

enkel laattijdig effect??

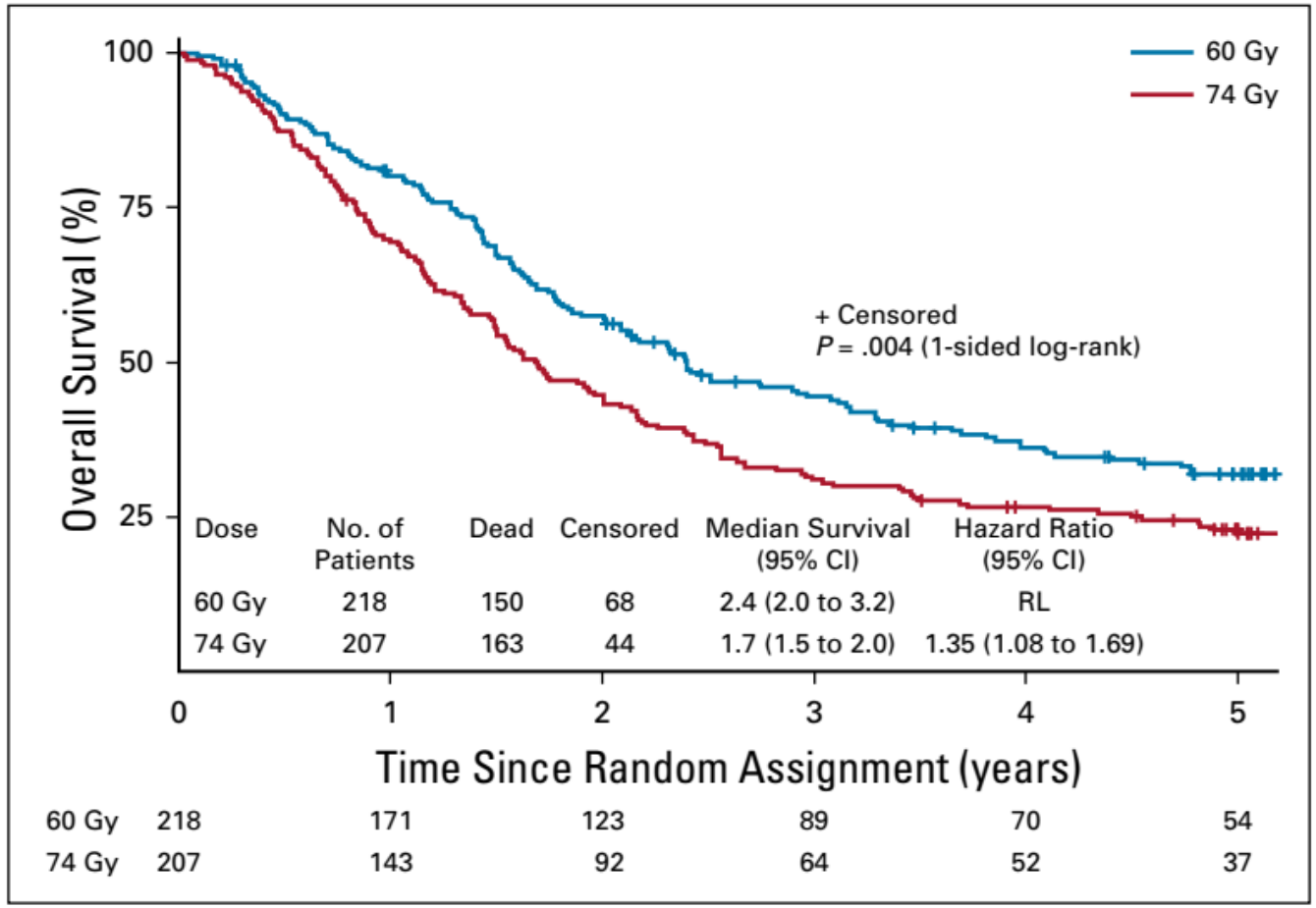


FIG 2. Overall survival by radiation therapy dose. RL, reference level.

Bradley 2019. J Clin Oncol

radiotherapie en longca

"minder belangrijk"

- nevenwerkingen = laattijdig (10 à 20j)
- prognose is beperkt
- weinig goede studies

⇒ nog sterk in evolutie
⇒ zorgpad nog in ontwikkeling

"zeer relevant!"

- nevenwerkingen al na maanden tot enkele jaren
- prognose ↑
- t.o.v. borstca: ↑↑ dosis
  - MHD: 2 vs 10 à 20 Gy
- belang van substructuren (LAD, basis, …)

Locquet 2024. BMC Cancer
Walls 2025. British Journal of Cancer
Yegya-Raman 2023. Curr Onc Reports

chemotherapie

- cisplatine, carboplatine, oxaliplatine
  - VTE, AMI, spasme, PAD
  - zelden hartfalen, maar grote vochtbelasting
  - nut van screening naar CAD = ?

- paclitaxel, docetaxel
  - sinusbradycardie, aritmie
  - zelden hartfalen, wel oedemen (via capillair lek)

gerichte behandelingen

- ALK-inhibitoren
  - bradycardie, ↑QTc
  - AHT, chol, DM

    => *opvolgen met ECG en labo*

crizotinib (Xalkori®)
brigatinib (Alunbrig®)
lorlatinib (Lorviqua®)
alectinib (Alecensa®)
ceritinib (Zykadia®)

- EGFR-inhibitor
  - HF, VTE, hypoMg en ↑QTc
  - pericardiale effusie

    => *opvolgen met ECG en TTE*

osimertinib (Tagrisso®)
erlotinib
gefitinib (Iressa®)
afatinib (Giotrif®)

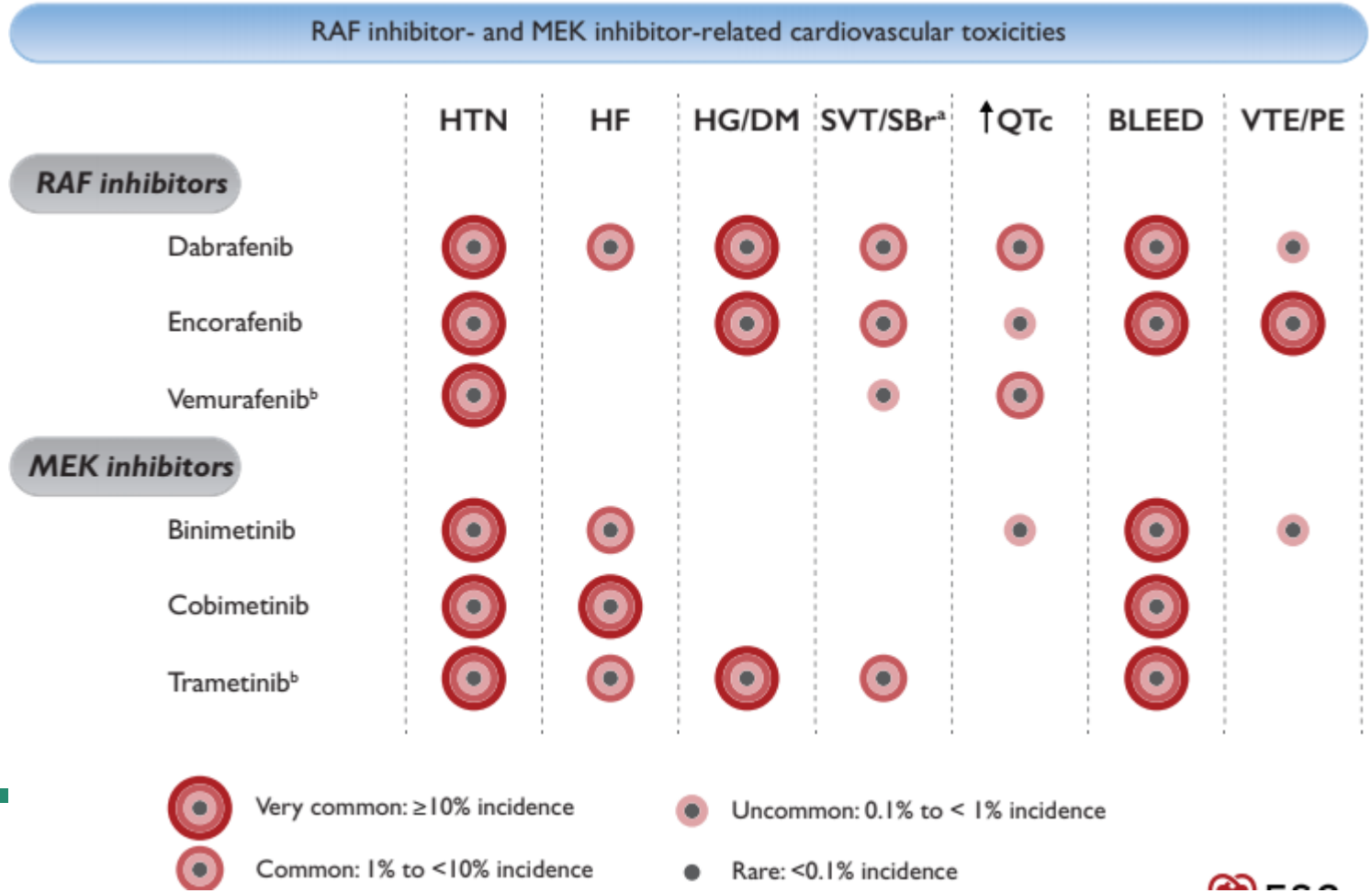
gecombineerde RAF- en MEK-inhibitoren

vemurafenib (Zelboraf®)+ cobimetinib (Cotellic®)
dabrafinib (Tafinlar®) + trametinib (Mekinist®)
encorafenib (Braftovi®)+ binimetinib (Mektovi®)

- HF (tot 2j nadien)
- AHT
- bloeding
- diabetes

=> *opvolgen met TTE*

- VTE bij encorafenib
- ↑QTc- bij vemurafenib + cobimetinib
  => ECG na w2-w4-m3-6-…
- oedemen bij vemurafenib en trametinib



VEGFi

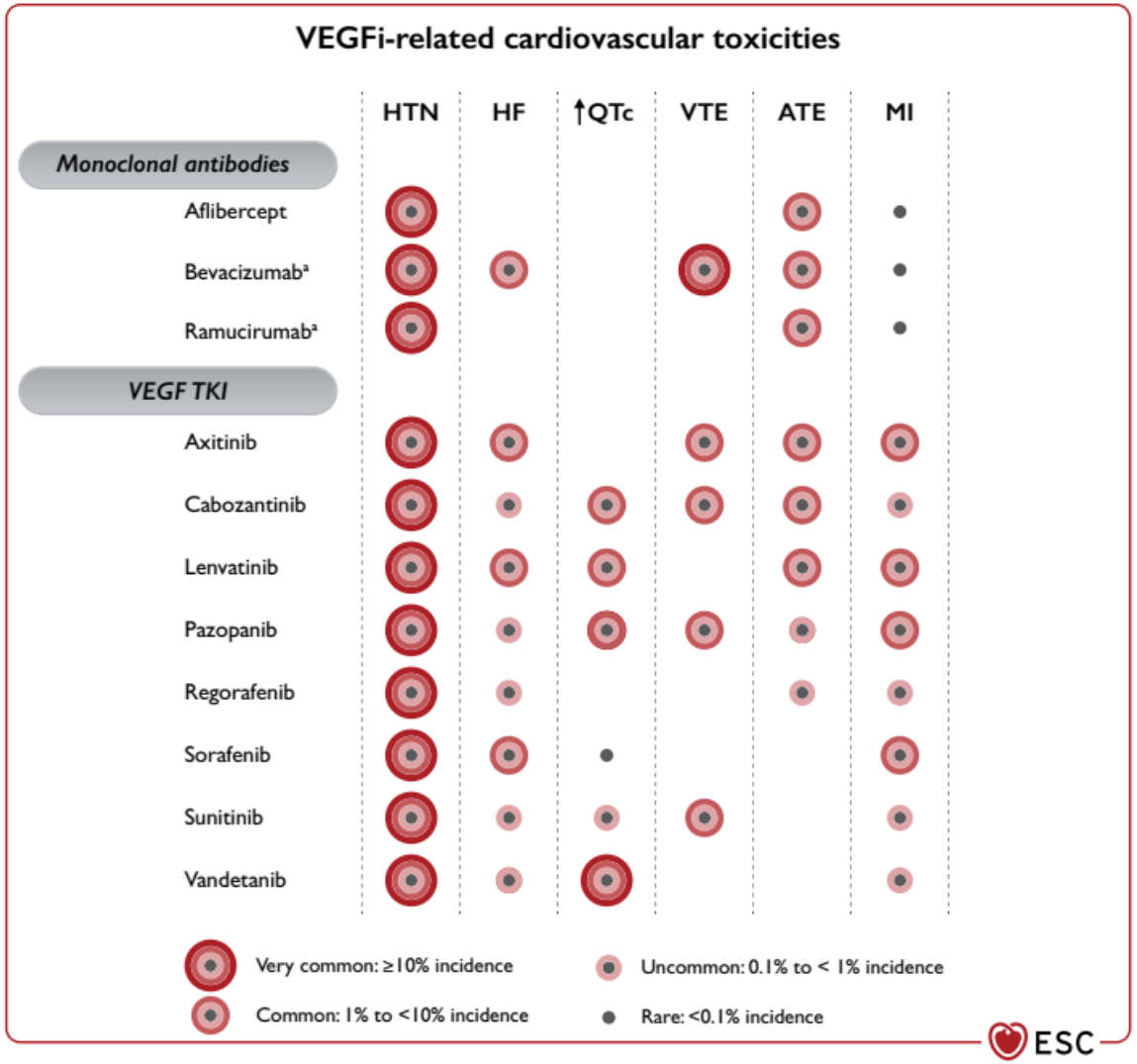
- **hypertensie** (minder BV = hogere weerstand; omkeerbaar)
- LV-dysfunctie: 5-10%
- QTc-verlenging
- AMI ; VTE

TKI (po)

sunitinib (Sutent®)
pazopanib (Votrient®)
sorafenib (Nexavar®)
axitinib (Inlyta®)
cabozantinib (Cabometyx®)
regorafenib (Stivarga®)
lenvatinib (Lenvima®)
vandetanib (Caprelsa®)

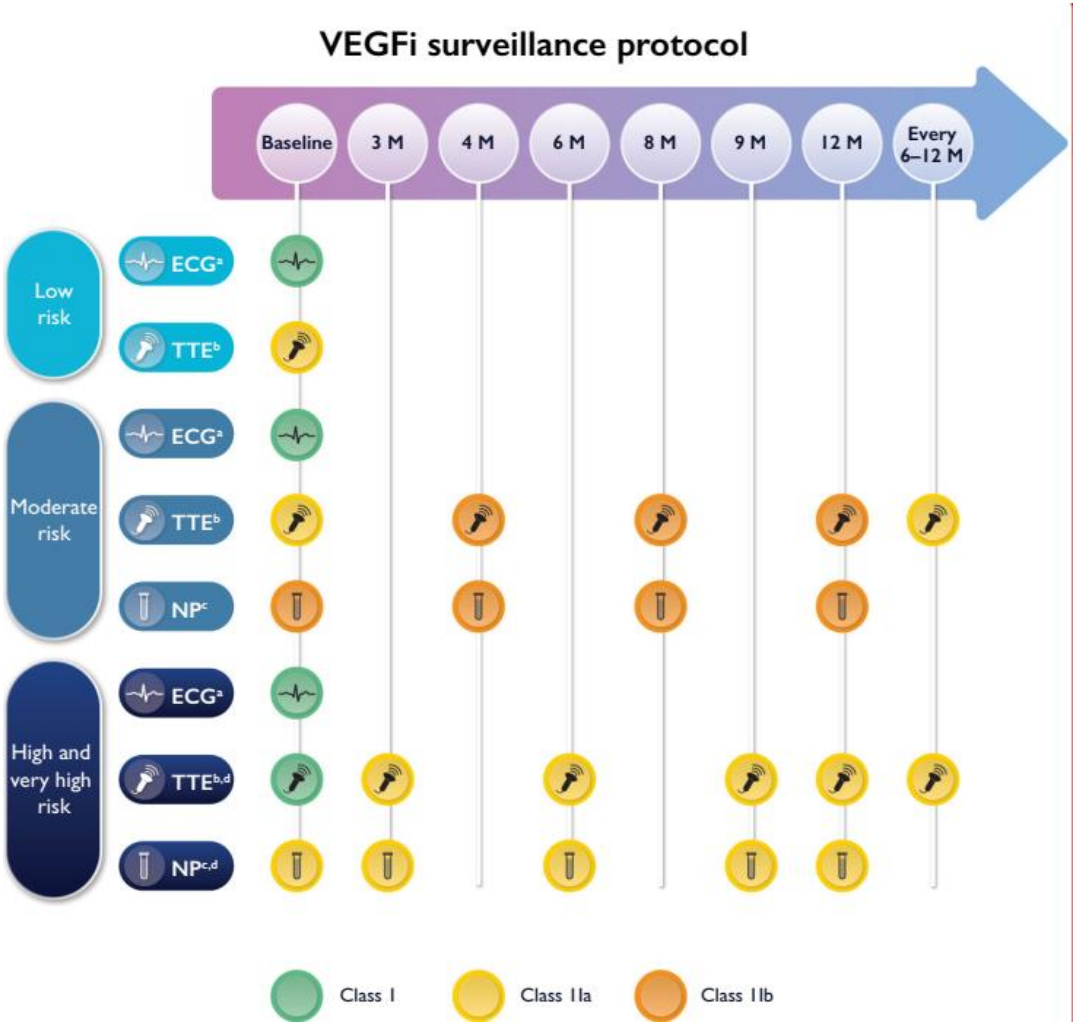
mAb (iv)

bevacizumab (Avastin®)
ramucirumab (Cyramza®)
aflibercept (Zaltrap®)



Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

VEGFi



als medium risk factors:
1 pt = laag risico
2-4 ptn = medium risico
≥5 = hoog risico

Risk factor	Score
Previous cardiovascular disease	
Heart failure or cardiomyopathy	Very high
Arterial vascular disease (IHD, PCI, CABG, stable angina, TIA, stroke, PVD)	Very high
Venous thrombosis (DVT or PE)	High
Baseline LVEF <50%	High
Borderline LVEF 50–54%	Medium[2]
QTc ≥480 ms	High
450 ms ≤ QTc <480 ms (men) 460 ms ≤ QTc <480 ms (women)	Medium[2]
Arrhythmia[a]	Medium[2]
Cardiac biomarkers (where available)	
Elevated baseline troponin[b]	Medium[1]
Elevated baseline BNP or NT-proBNP[b]	Medium[1]
Demographic and cardiovascular risk factors	
Age ≥75 years	High
Age 65–74 years	Medium[1]
Hypertension[c]	High
Diabetes mellitus[d]	Medium[1]
Hyperlipidaemia[e]	Medium[1]
Chronic kidney disease[f]	Medium[1]
Proteinuria	Medium[1]
Previous cardiotoxic cancer treatment	
Prior anthracycline exposure	High
Prior radiotherapy to left chest or mediastinum	Medium[1]
Lifestyle risk factors	
Current smoker or significant smoking history	Medium[1]
Obesity (BMI >30 kg/m^2)	Medium[1]
Risk level	

Lyon et al. Baseline cardiovasculair risk assessment in cancer patients. Eur J Heart Fail 2020
Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

richtlijnen

IMMUUNCHECKPUNT-INHIBITIE

immuun-checkpoint-inhibitoren

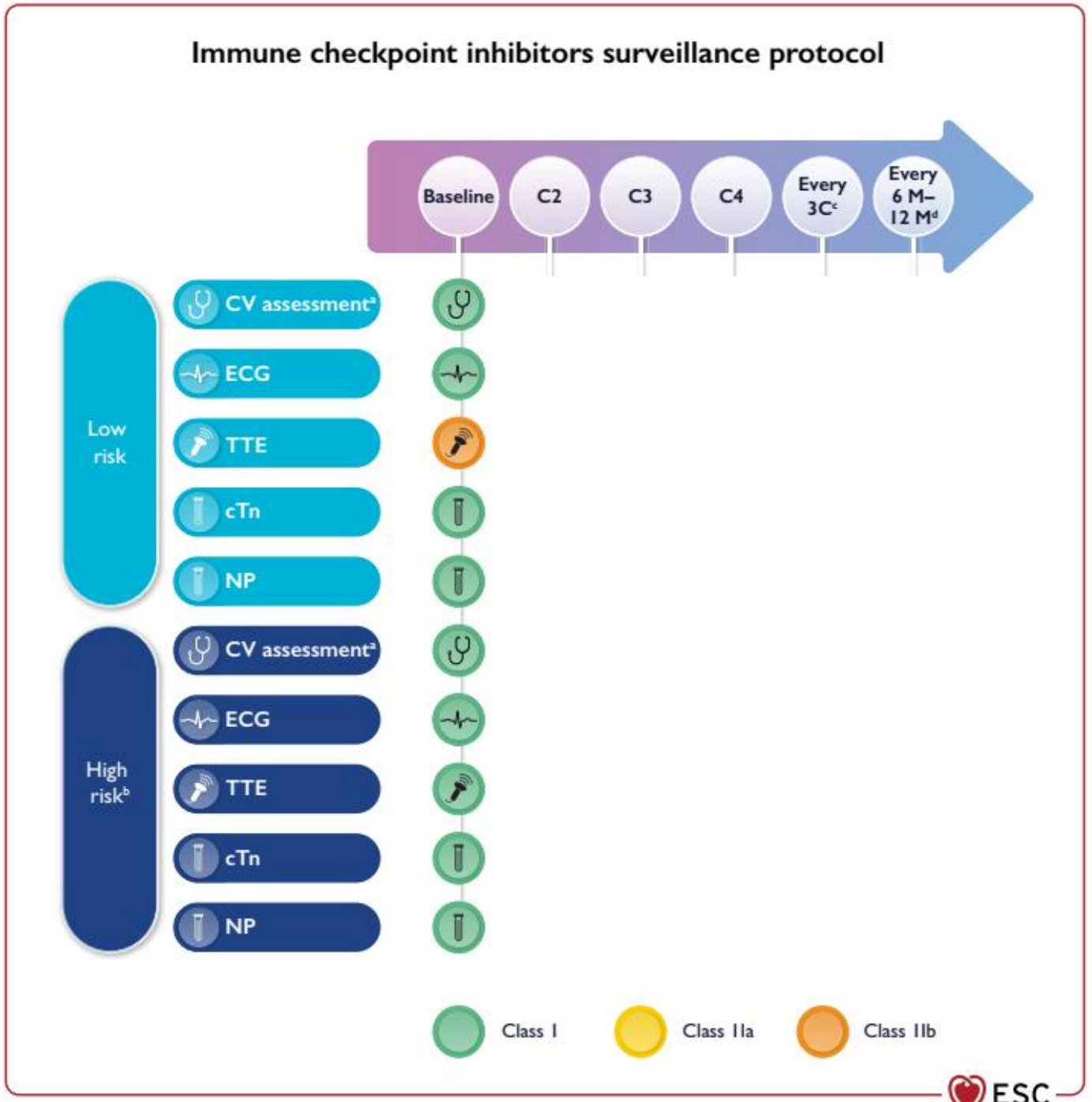
- **myocarditis**
- pericarditis
- hartfalen (zonder –itis)
- VT
- AV-blok
- AMI
- cholesterol

ipilimumab (Yervoy®)
nivolumab (Opvido®)
pembrolizumab (Keytruda®)
atezolizumab (Tecentriq®)
avelumab (Bavencio®)
durvalumab (Imfinzi®)
cemiplimab (Libtayo®)

Celutkiene 2020. Imaging in cancer patients. Eur J Heart Fail

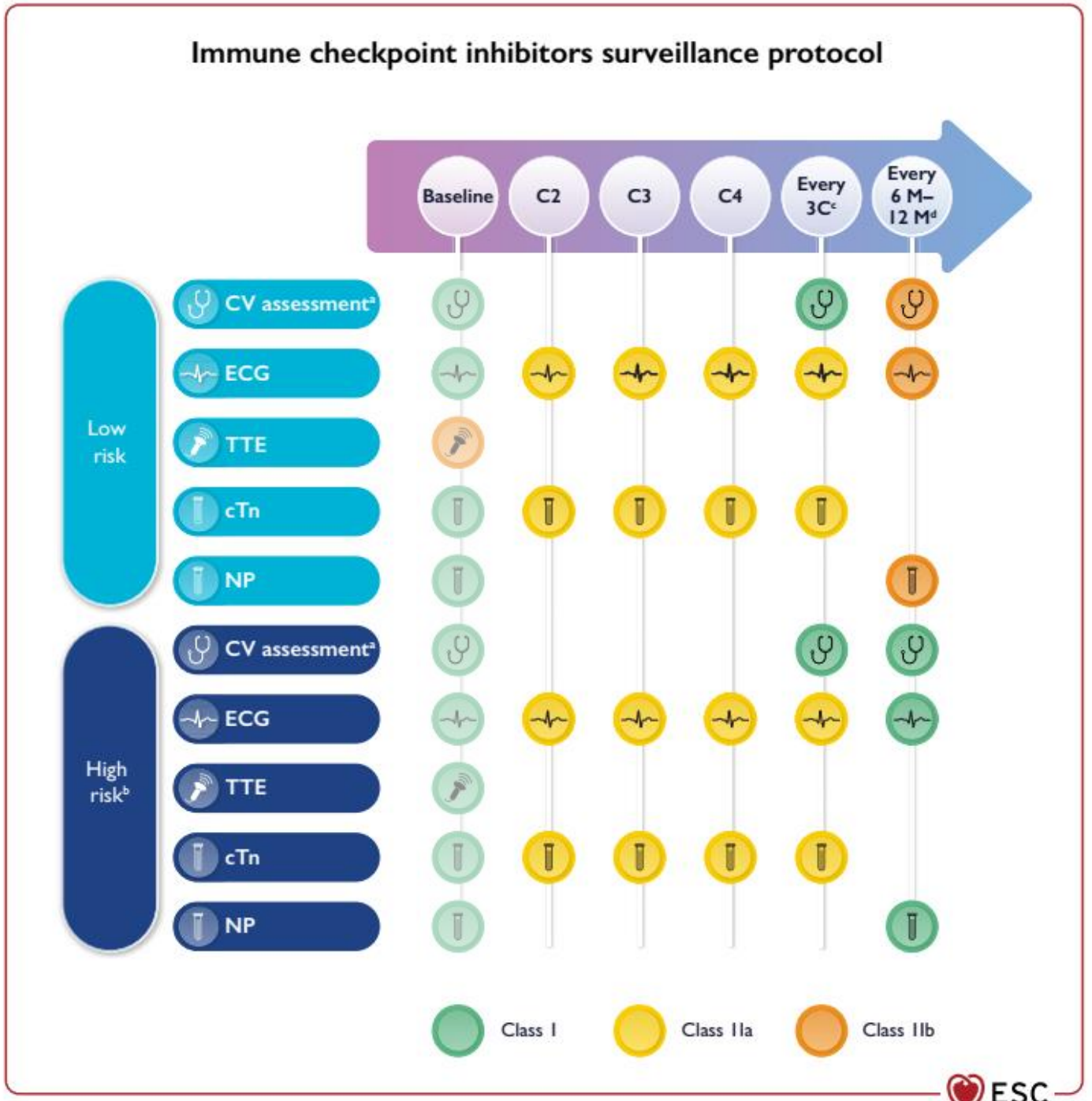
ICI - opstart

- ECG en Tn (en NT-proBNP) bij iedereen
- TTE bij hoogrisico
  - dubbele ICI of andere cardiotoxische medicatie
  - andere irAE
  - cardiovasculaire aandoening vooraf



ICI - opvolging

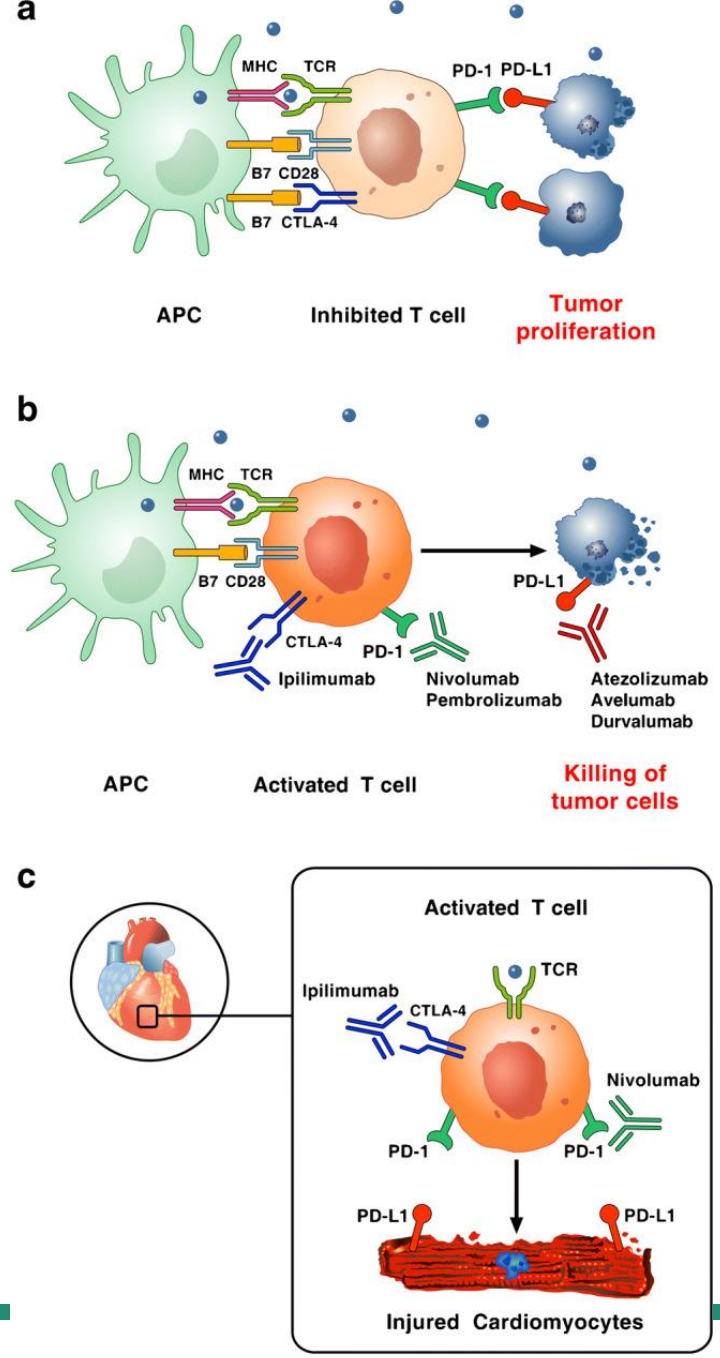
- ECG en Tn bij iedereen



capita selecta

IMMUUNCHECKPUNT-INHIBITIE

ICI

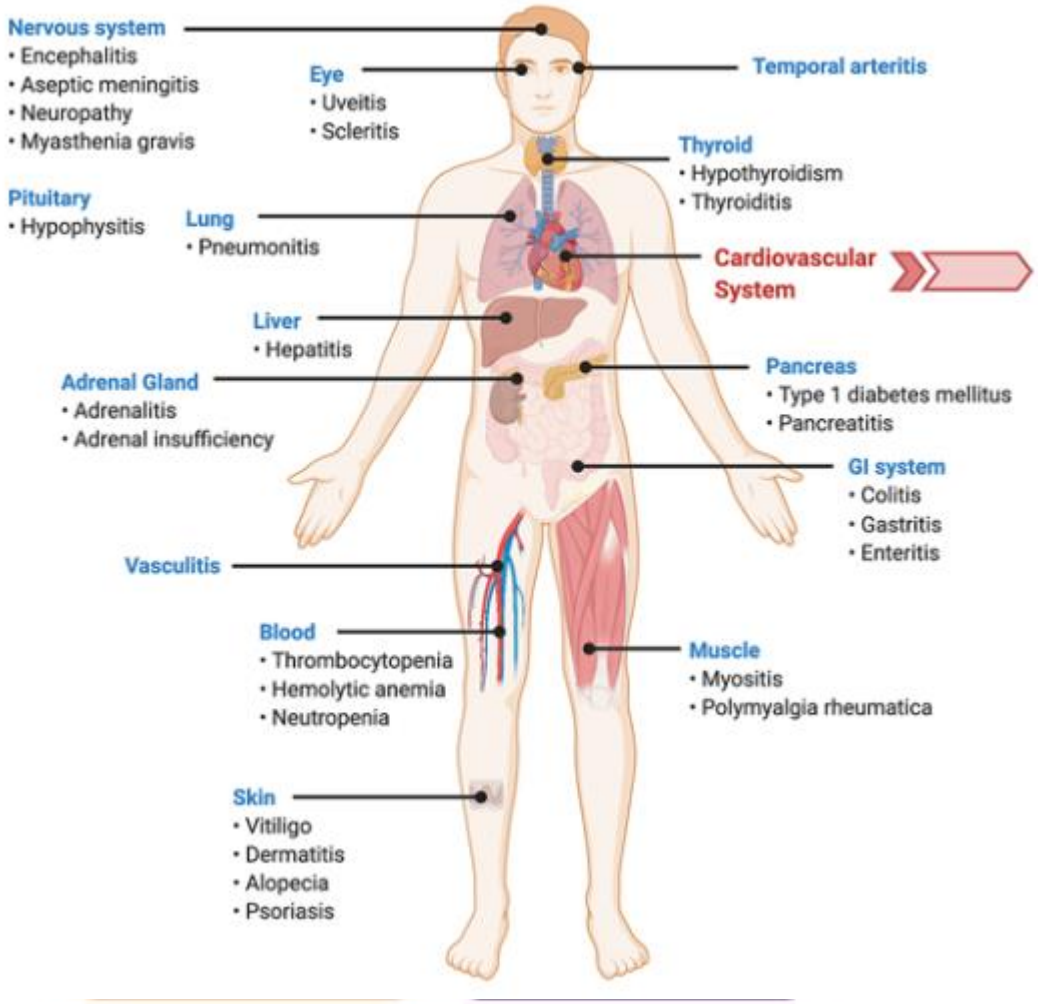


- tumorcel misbruikt inhiberende immuuncheckpoints
- R/ ICI (mAb's)
- nadeel: immune-related adverse events (irAEs)
  - meest dodelijke: myocarditis

Varricchi 2017. Cardiac Toxicity of Immune Checkpoint Inhibitors. Circulation

immuun-checkpoint-inhibitoren

- indicaties ↑
  - tot 36% v/d onco-patiënten
- toxiciteit zal toenemen



Baik et al. Cardiovascular toxicities associated with immune checkpoint inhibitors. Clin Science 2021

myocarditis

- 0,04 – 1,14%
- na 2 weken à 2 maanden; ook na stoppen ICI!
  - later = meestal niet-inflammatoir
- mortaliteit: 40%
- cave ICI-combinatietherapie

- opm: retrospectieve data!

Baik et al. Cardiovascular toxicities associated with immune checkpoint inhibitors. Clin Science 2021

troponines

- in 94% (≠ 100%) van myocarditis
- prognostisch

- CK-stijging als marker van ernstige myocarditis?

Baik et al. Cardiovascular toxicities associated with immune checkpoint inhibitors. Clin Science 2021

studie (n=126): prospectieve screening

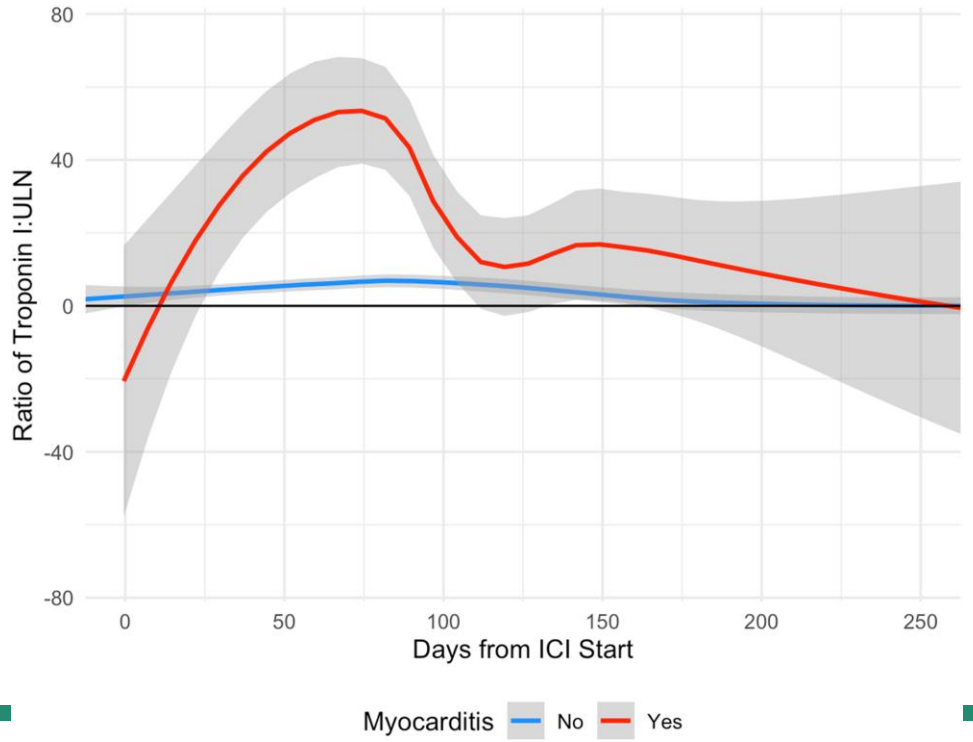
- myocarditis frequenter (10,3%) dan gedacht
  - zonder screening: groot deel wordt gemist
- vaak asymptomatisch of mild (69,2%)
- verderzetten ICI vaak mogelijk

- Is screening dan nuttig?

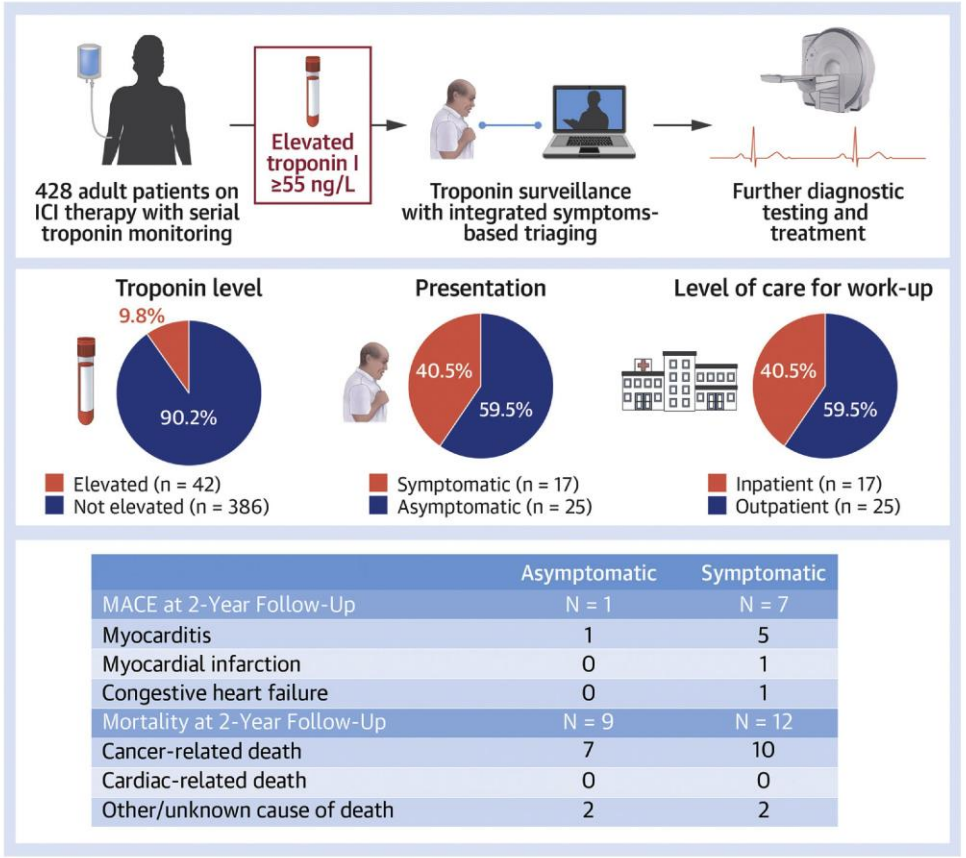
Furukawa et al. Prospective screening for myocarditis in cancer patients treated with immune checkpoint inhibitors. J of Cardiol 2023

Screening nuttig?

- restrospectief, single center
- cTnI elevation as an initial screening tool followed by symptom assessment—may help identify patients who warrant further diagnostic work-up for myocarditis.



CENTRAL ILLUSTRATION: Clinical Presentation and Management of Patients With cTnI Elevation During ICI Monitoring



	Asymptomatic	Symptomatic
MACE at 2-Year Follow-Up	N = 1	N = 7
Myocarditis	1	5
Myocardial infarction	0	1
Congestive heart failure	0	1
Mortality at 2-Year Follow-Up	N = 9	N = 12
Cancer-related death	7	10
Cardiac-related death	0	0
Other/unknown cause of death	2	2

Cheng E, et al. JACC CardioOncol. 2025;7(6):708-721.

seriële opvolging van troponines bij ICI

- 20%: Tn↑
  waarvan ½ zonder duidelijke oorzaak
- oorzaak ~ hoogte Tn
  ~ tijd tot stijging

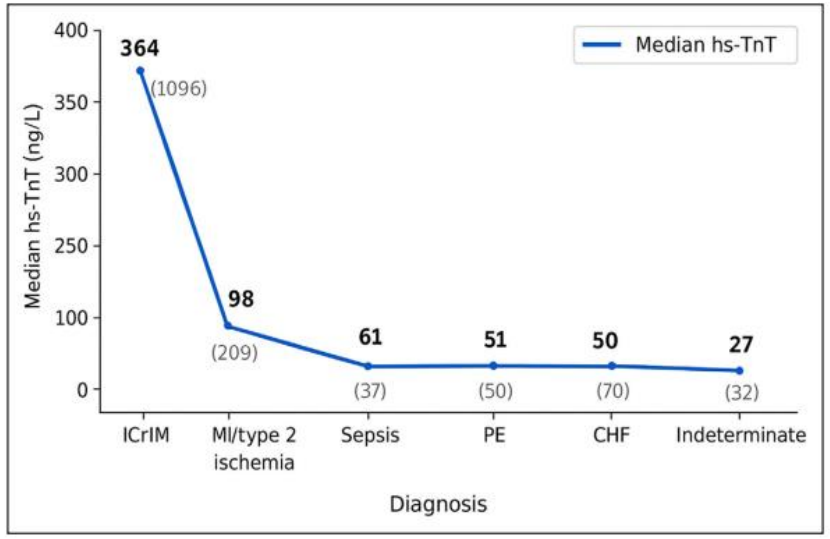


Figure 2. **Median hs-TnT and IQR values (in brackets) for each diagnosis.**

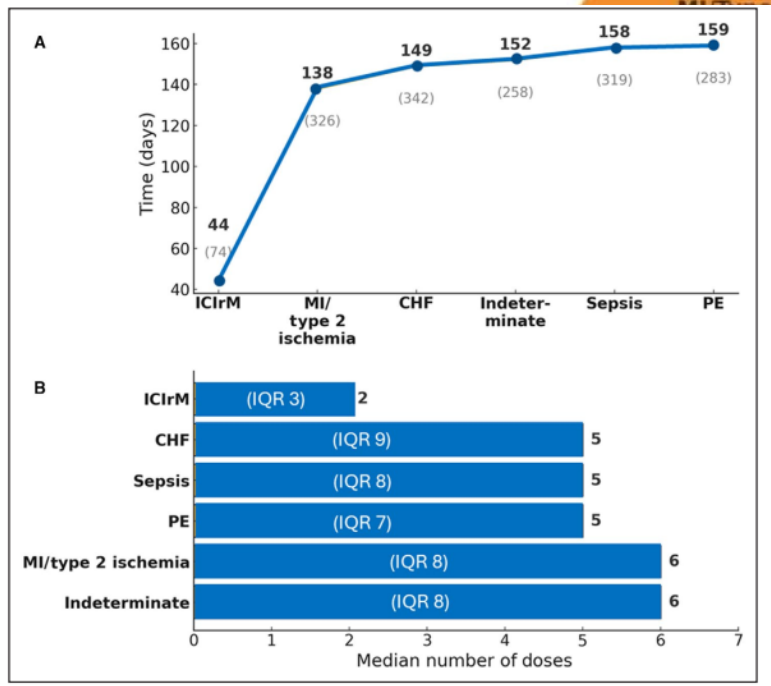
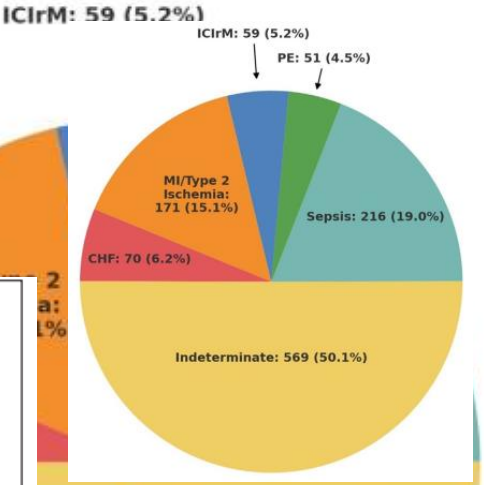


Figure 3. **Time to each diagnosis after the initiation of ICI.**
A, Median time from the first ICI dose to elevation of hs-TnT. **B**, Median number of doses. CHF indicates chronic heart failure; ICIrM, immune-checkpoint inhibitor related myocarditis; IQR, interquartile range; MI, myocardial infarction; and PE, pulmonary embolism.



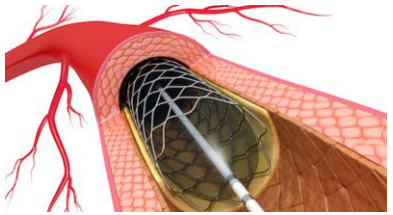
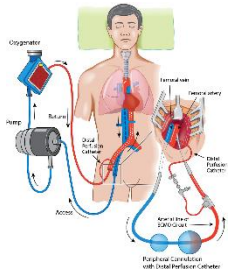
Pietri 2025. JAHA

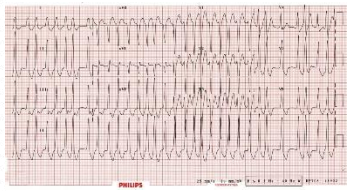
myocarditis

- kliniek: alles is mogelijk
  - asymptomatisch / infarct / acuut hartfalen en shock / chronisch hartfalen / aritmie en AV-blok / plotse dood
  - + myositis (25%)
  - + “myasthenia gravis” (15%) : ptose

→ check op myocarditis








Baik et al. Cardiovascular toxicities associated with immune checkpoint inhibitors. Clin Science 2021

myocarditis

- diagnose: moeilijk – geen consensus

CLINICAL SUSPICION OF ICIs-RELATED MYOCARDITIS

Initial tests:
Troponin, ECG, Echocardiogram

Exclude common causes: acute coronary artery disease, infective myocarditis

Histopathological diagnosis

Clinical diagnosis:
New or significant change of cTn
+
1 major criterion or 2 minor criteria

MAJOR CRITERION
CMR positive for modified Lake Louis criteria

1. **Non-ischemic injury (T1 based)**
   - Abnormal T1m
   - Increased ECV
   - LGE

+

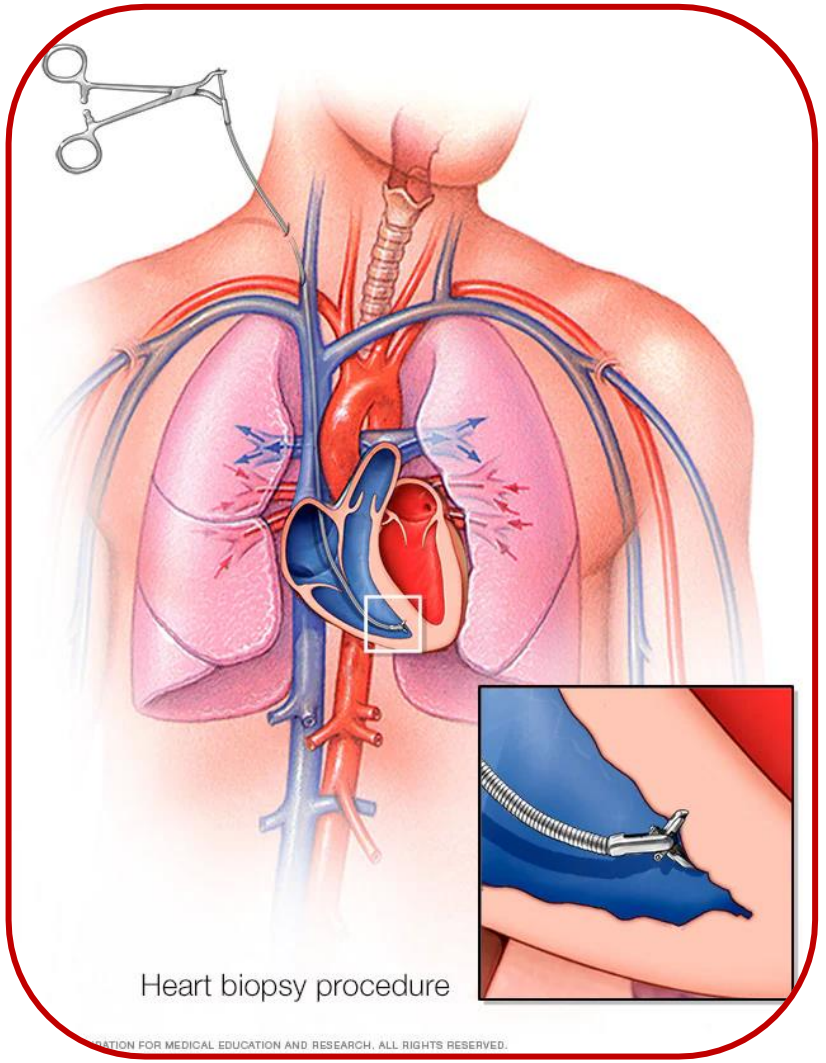
2. **Myocardial oedema (T2 based)**
   - Abnormal T2m
   - Abnormal T2w

+/-

3. **Supportive criteria**
   LV disfunction, pericardial effusion

MINOR CRITERION:
- clinical syndrome
- ventricular arrhythmia
-decline in LV function
- other irAEs: myositis, myasthenia gravis
- CMR suggestive (T2- or T1 – based criteria in appropriate clinical scenario)

Myocarditis confirmed



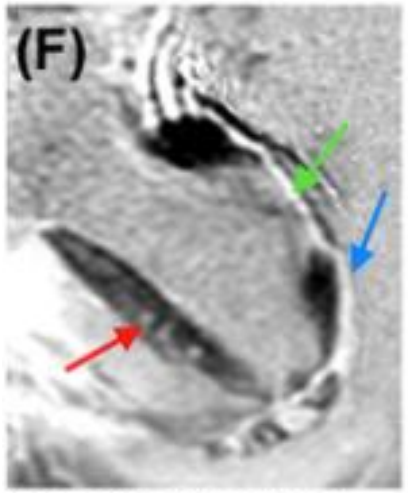
Frascaro 2023. J Clin Med

cMRI

vanaf dag 4
45-60 min

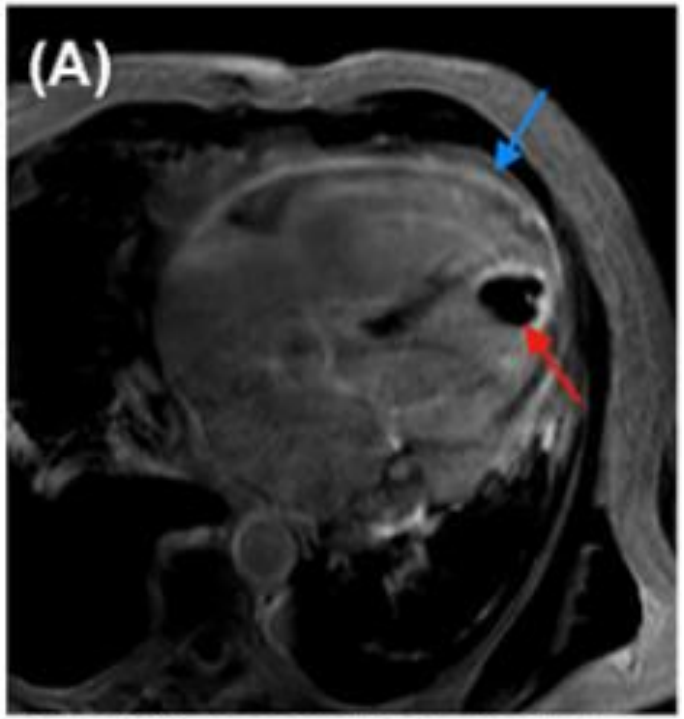
2018 Lake Louise Criteria	
Main Criteria	**Myocardial Edema** (T2-mapping or T2W images)
	Non-ischemic Myocardial Injury (Abnormal T1, ECV, or LGE)
Supportive Criteria	**Pericarditis** (Effusion in cine images or abnormal LGE, T2, or T1)
	Systolic LV Dysfunction (Regional or global wall motion abnormality)

Ferreira, V.M. et al. J Am Coll Cardiol. 2018



Cardiac MR with contrast

transmurale en 'patchy' LGE
pericardiale aankleuring



Cardiac MR with contrast, 4-chamber view

LGE en thrombus

Baik et al. Cardiovascular toxicities associated with immune checkpoint inhibitors. Clin Science 2021

myocarditis - behandeling

- stop ICI
- monitoring
- hoge dosis steroïden
  - *onmiddellijk* indien onstabiel / VT / totaal AV-blok
  - methylprednisolone 1x1g IV gedurende 3 dagen
  - oraal afbouwschema gedurende maanden (prednisone 1mg/kg/d ==> -10mg/week)
- steroïd-resistentie: weinig data
- hervatten? – multidisciplinair overleg



EMB should be considered to confirm the diagnosis of ICI-associated myocarditis if the diagnosis is suspected but not confirmed after cardiac imaging and biomarkers.[c]	IIa	C
Interruption of ICI treatment is recommended in patients with confirmed ICI-associated myocarditis.	I	C
Continuous ECG monitoring to assess for new AV block and tachyarrhythmias during the acute phase is recommended for all patients with symptomatic ICI-associated myocarditis.	I	C
Early high-dose corticosteroids[d] are recommended in patients with cancer and confirmed ICI-associated myocarditis.[22,436,454]	I	C
Continuation of high-dose corticosteroids is recommended for the treatment of ICI-associated myocarditis until resolution of symptoms, LV systolic dysfunction, conduction abnormalities, and significant cTn reduction.[e]	I	C
Switching from i.v. to oral prednisolone should be considered after clinical improvement (resolution of: symptoms, LV systolic dysfunction, conduction abnormalities, and significant cTn reduction[e]).[f]	IIa	C
Second-line immunosuppression treatment should be considered in patients with steroid-refractory ICI-associated myocarditis.[g]	IIa	C
Admission to ICU (level 3), treatment with i.v. methylprednisolone, and optimal CV treatment including mechanical support (when indicated) is recommended for patients with ICI-associated fulminant myocarditis.[14]	I	C
A single dose of i.v. methylprednisolone[d] should be considered in unstable[h] patients with cancer where ICI-induced myocarditis is suspected.	IIa	C
A multidisciplinary discussion is recommended before restarting ICI treatment in selected patients with previous uncomplicated ICI-associated myocarditis	I	C

Lyon et al. Guidelines on cardio-oncology. EHJ 2022

ICI-induced myocarditis	
1st line therapy	Withdraw ICI, reassess Non-severe: methylprednisolone 500–1000 mg/day × 3 days, then taper with oral prednisone Severe: i.v. methylprednisolone 7–14 mg/kg/day × 3 days, then 1 mg/kg/day
2nd line therapy	If no response in 24–48 h: mycophenolate mofetil[b], ATG[g] abatacept[l], alemtuzumab[m]
3rd line therapy	Infliximab[j] or adalimumab[k], rituximab[i]

ATG, anti-thymocyte globulins; b.i.d., twice daily; CTLA-4, cytotoxic T-lymphocyte antigen 4; EM, eosinophilic myocarditis; ICI, immune checkpoint inhibitor; IgG, immunoglobulin; IL, interleukin; i.v., intravenous; IVIG, intravenous immunoglobulins; p.o., by mouth; s.c., subcutaneous; t.i.d., three times daily; TNF-α, tumour necrosis factor alpha.
[a]Azathioprine (immunosuppressant purine analog): 1–2 mg/kg per day p.o. (typically 100–150 mg daily, in 1–2 divided doses, main target: lymphocytes).
[b]Mycophenolate mofetil (immunosuppressant that inhibits inosine monophosphate dehydrogenase, main target: lymphocytes): 500–1000 mg p.o. b.i.d. (total 1–2 g/day).
[c]Cyclosporine (calcineurin inhibitor that prevents IL-2 transcription in activated T-cells): ~3–5 mg/kg/day p.o. (divided b.i.d.) adjusted to target trough levels ~150–250 ng/mL.
[d]Methotreaxate (antimetabolite that inhibits dihydrofolate reductase and other folate-dependent steps, reducing proliferation of active lymphocytes): 15–20 mg/week p.o. or s.c. (low-dose weekly, with folic acid supplementation).
[e]IVIG (immunomodulatory therapy providing pooled IgG antibodies) = standard dose off-label 2 g/kg total dose, typically administered over 1 to 2 days; alternative dosing: 0.4 g/kg/day for 5 consecutive days (less commonly used in myocarditis but sometimes used in autoimmune settings).
[f]Plasmapheresis (therapeutic plasma exchange that filters out and removes circulating autoantibodies, immune complexes, and inflammatory mediators) 3–5 sessions in 5–10 days.
[g]Antithymocyte Globulin (ATG; polyclonal anti-T-lymphocyte antibody that causes profound T-cell depletion): ~1 mg/kg i.v., often given daily for 3–5 days.
[h]Cyclophosphamide (cytotoxic alkylating agent that crosslinks DNA in rapidly dividing cells, main target: lymphocytes): 600 mg/m^2 i.v. bolus on days 1, 15, and 30 (pulse therapy).
[i]Rituximab (monoclonal antibody against CD20 on B cells): 375 mg/m^2 i.v. weekly × 4 doses (1 month).
[j]Infliximab (monoclonal antibody against TNF-α): 5 mg/kg i.v. at weeks 0, 2, 6, then every ~8 weeks (maintenance).
[k]Adalimumab (anti-TNF-α fully human monoclonal antibody) 40 mg SC every week (or every 2 weeks, per clinical response).
[l]Abatacept (CTLA-4 Ig fusion protein that binds CD80/86 on antigen-presenting cells, blocking the CD28 co-stimulatory signal required for full T-cell activation): 500 mg i.v. every 2 weeks × 5 doses (approximately 10 weeks).
[m]Alemtuzumab (monoclonal antibody against CD52 on lymphocytes): 30 mg i.v. once (alternative: 15 mg i.v. daily for 2 days).

Schulz-Menger et al. Guidelines pericarditis and myocarditis. EHJ 2025

Moeilijke ICI-casussen

Belgian Multidisciplinary Immunotoxicity Board (BITOX)

BACK TO BITOX/immunomanager

BITOX

Aim: Share expertise, register cases, harmonize the management of adverse events (irAEs or T-cell engager toxicity), and identify clinically relevant research questions.

Submit a case

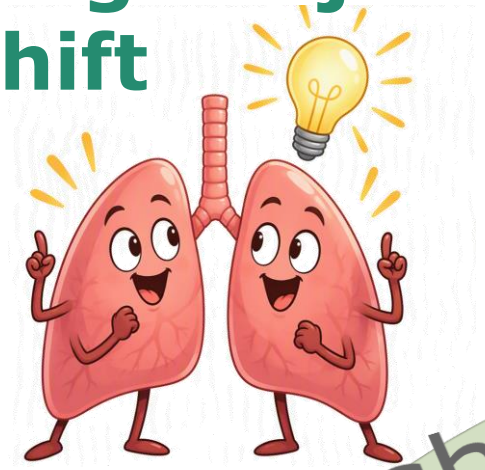
SURVEILLANCE

opvolging tijdens therapie en langetermijn

weinig specifieke aanbevelingen
=>
gebruik schema van eventuele andere behandeling



cardio-oncologie bij longkanker: paradigmashift



shift

- slechte prognose
- medicatie minder cardiotoxisch dan klassiekers (antracyclines en trastuzumab)
- minder onderzoek beschikbaar

- prognose ↑
- roken en soc.econ. => ↑basisrisico
- longen zitten in de borstkas => invloed op RT en HK

Take home



- documenteer CV risicoprofiel bij diagnose
- meet bloeddruk en behandel cholesterol
- bekijk coronairen op CT
- verwijs hoogrisicopatiënt
- Δ troponines als signaal
- samenwerking en overleg