



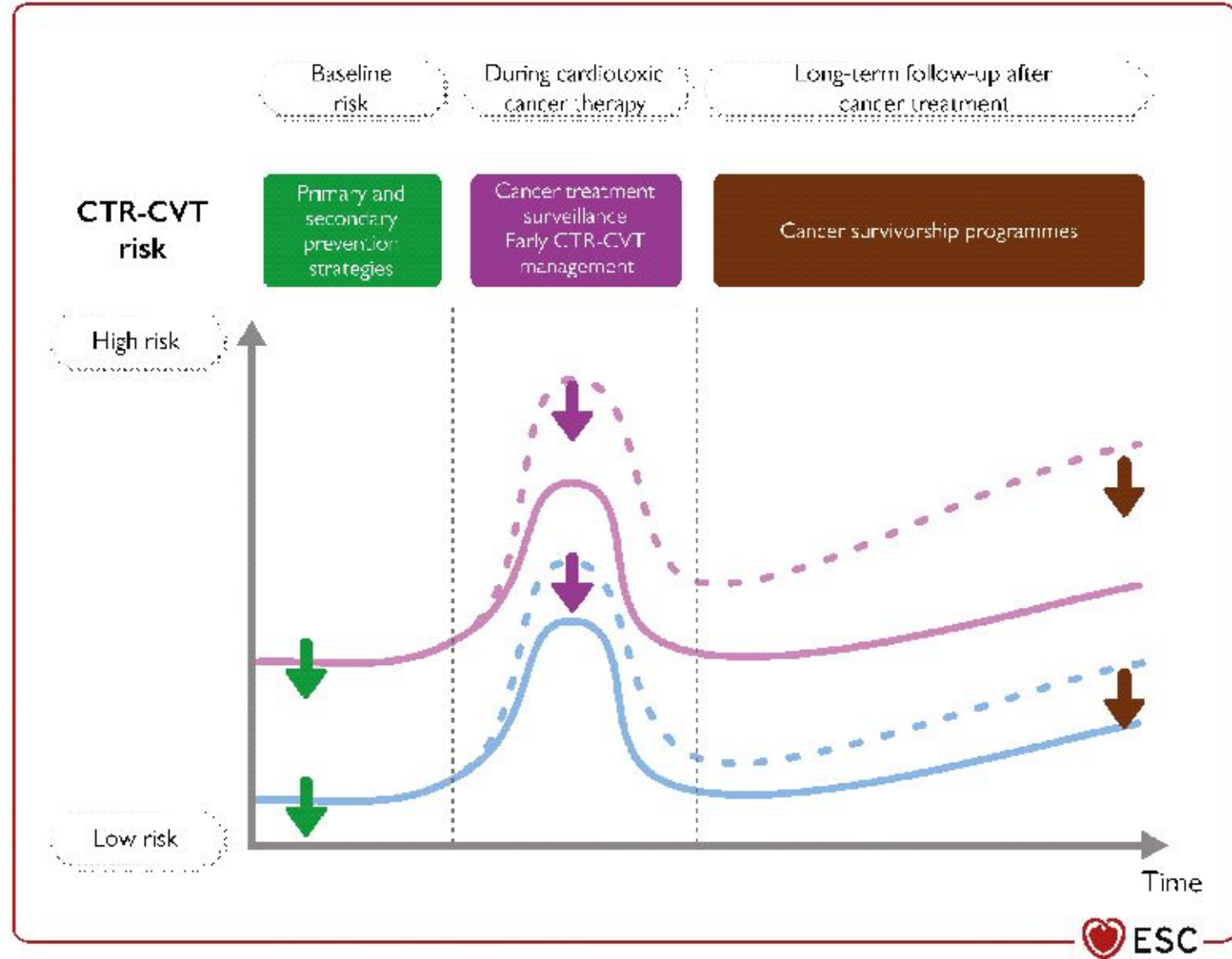




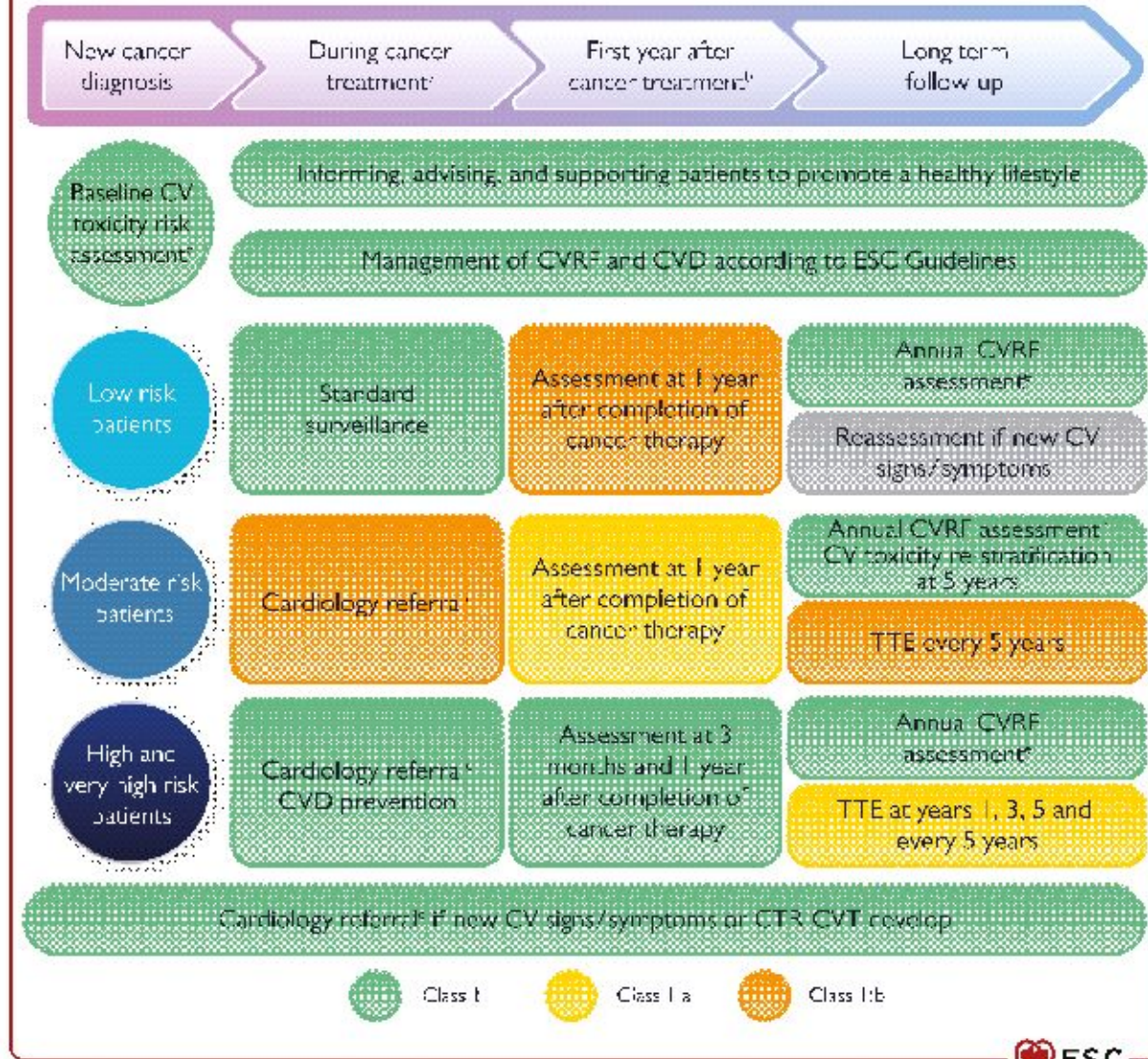


	Definition	Wording to use
<b>Class I</b>	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended or is indicated
<b>Class II</b>	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
<b>Class III</b>	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

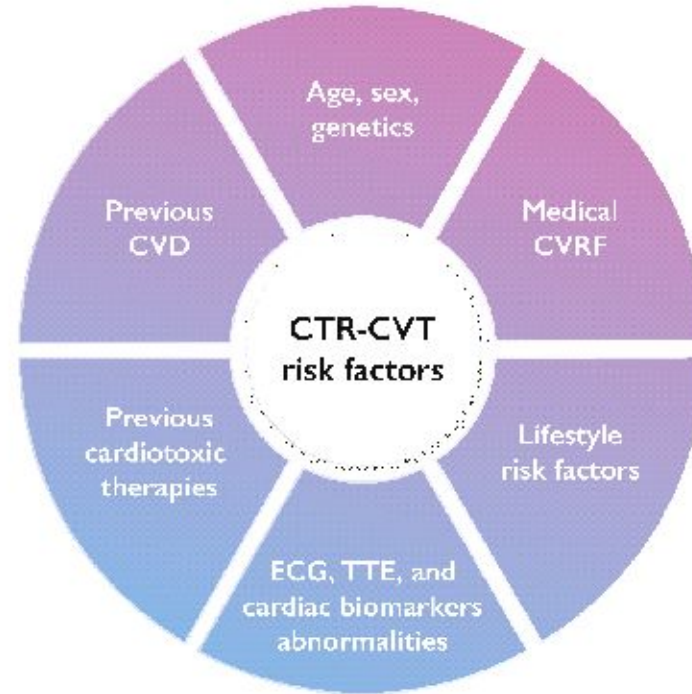


## Cardio-Oncology Care Pathways





## Baseline CV toxicity risk assessment checklist

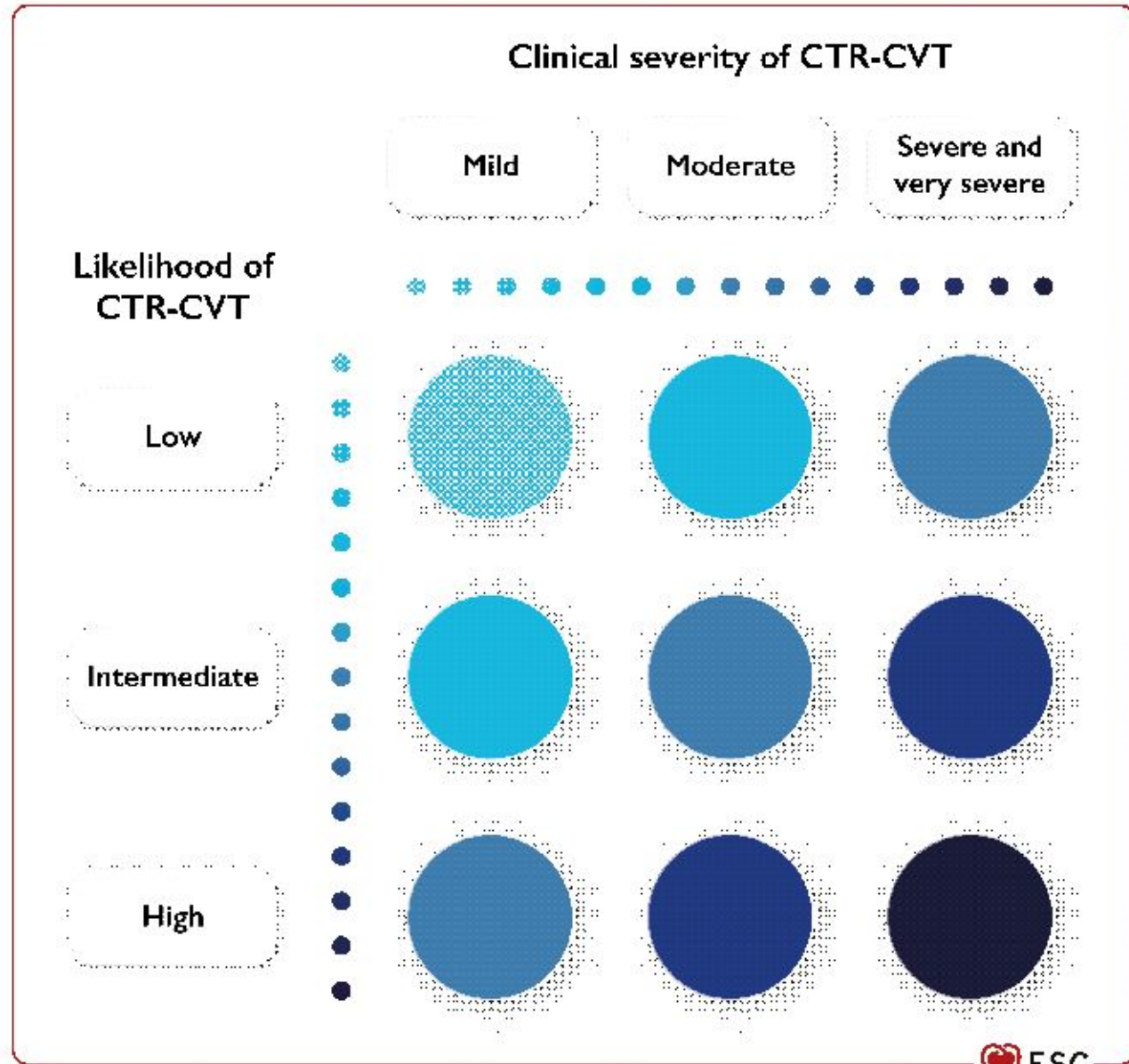


### Clinical assessment

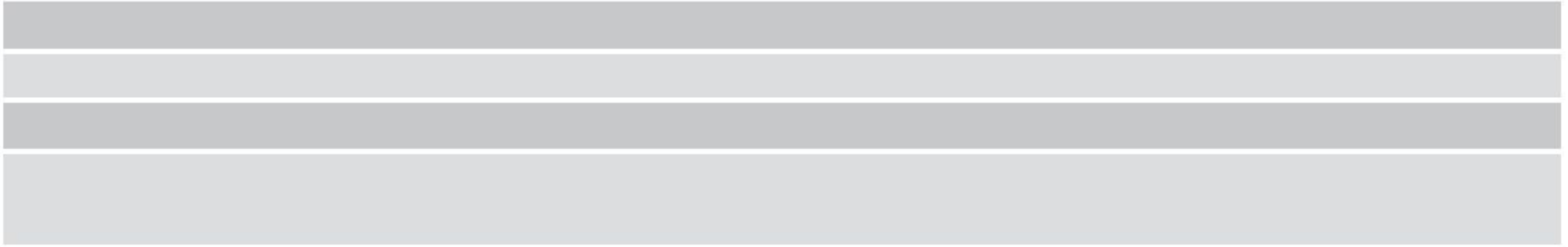
- Cancer treatment history
- CV history
- CVRF
- Physical examination
- Vital signs measurement<sup>a</sup>

### Complementary tests

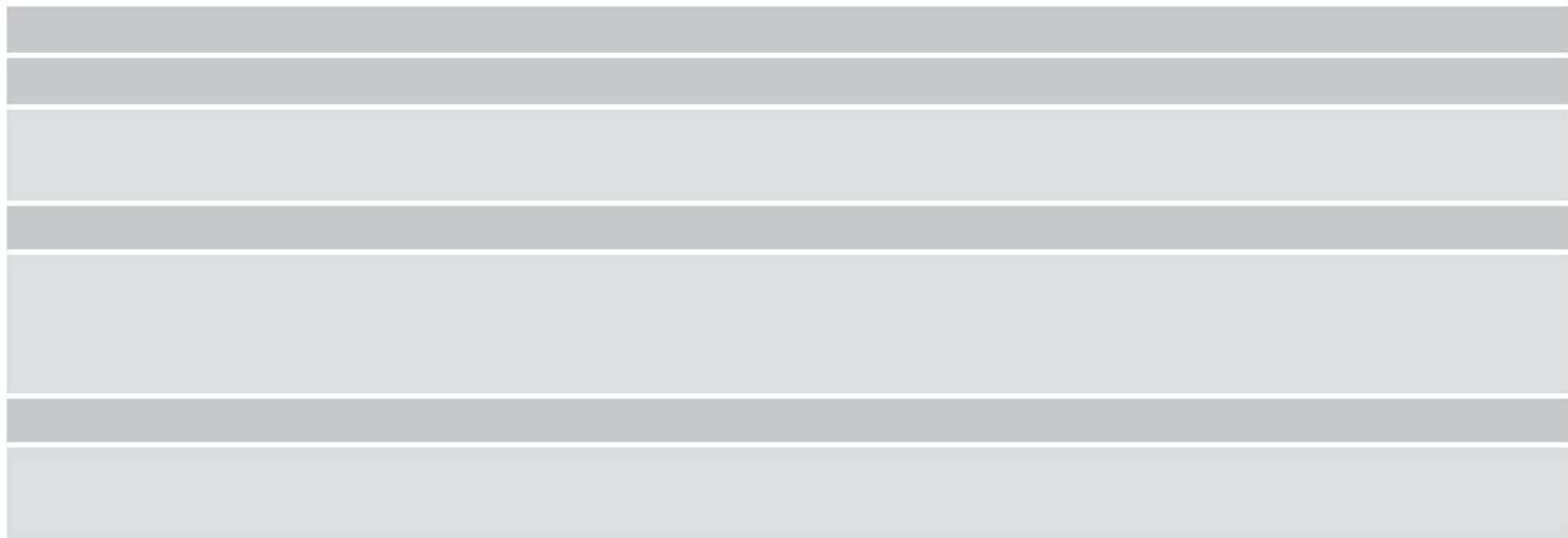
- BNP or NT-proBNP<sup>b</sup>
- cTn<sup>c</sup>
- ECG
- Fasting plasma glucose / HbA1c
- Kidney function / eGFR
- Lipid profile
- TTE<sup>d</sup>

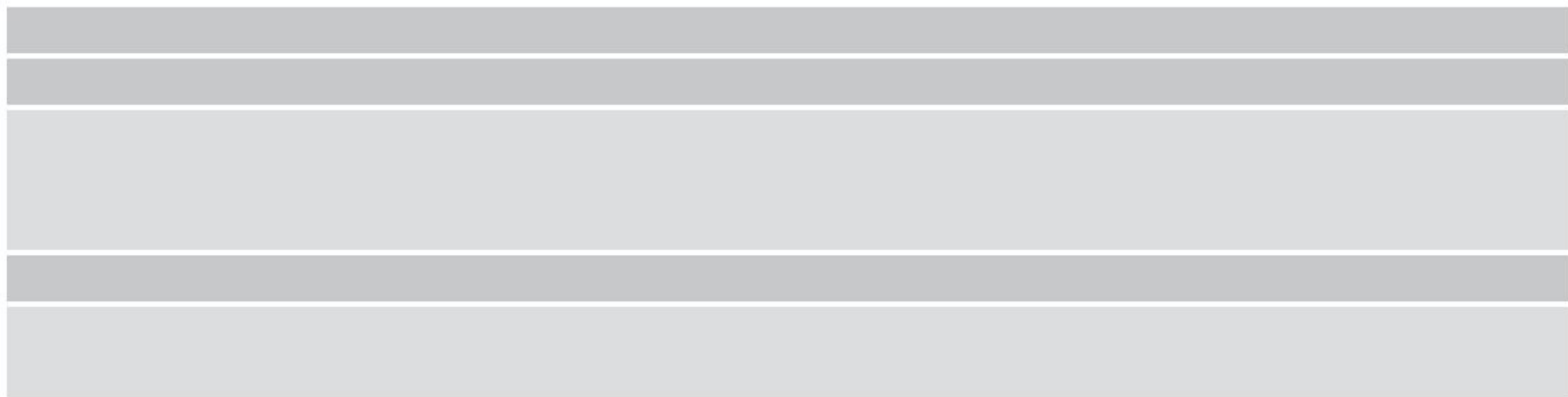










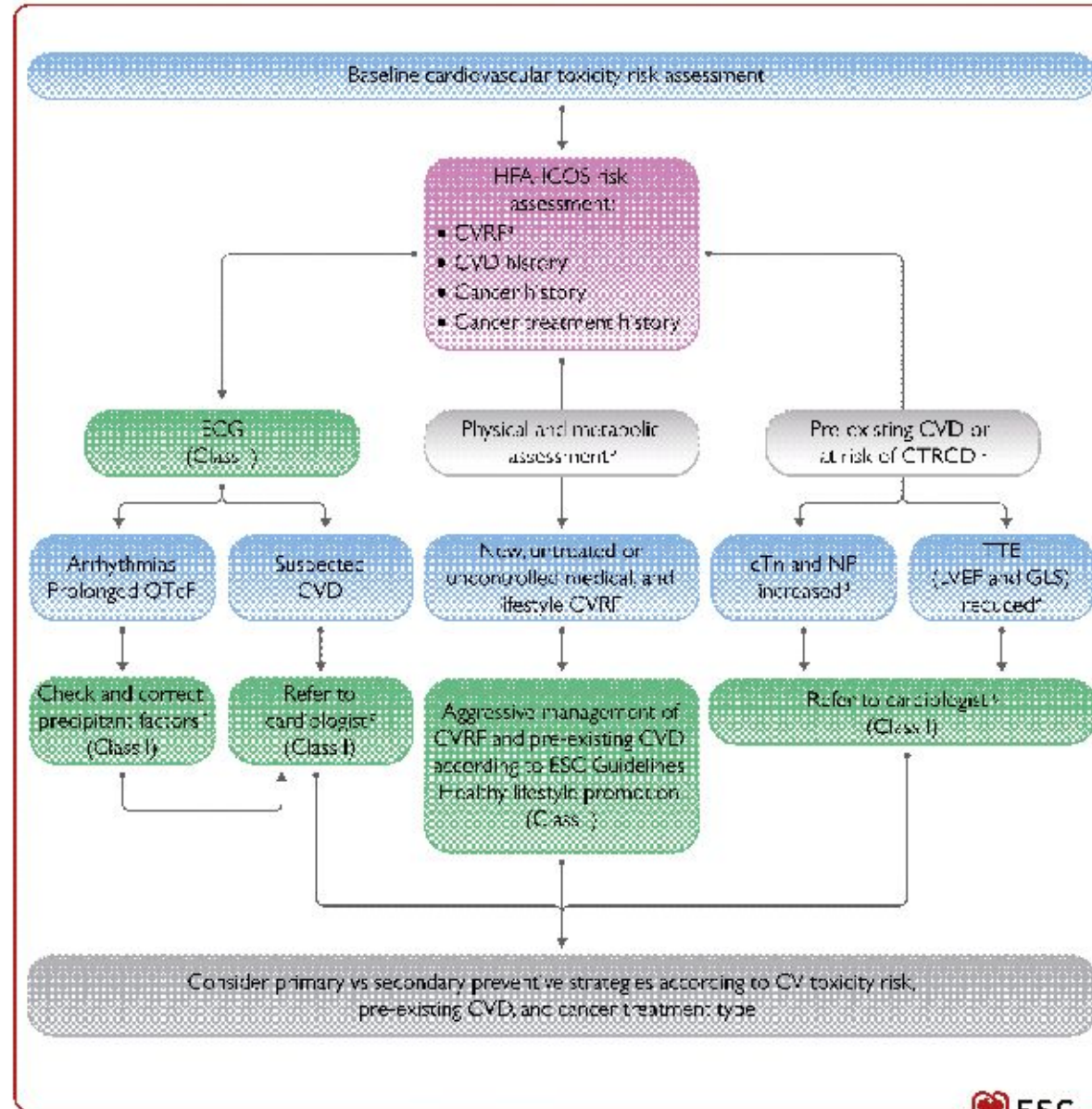












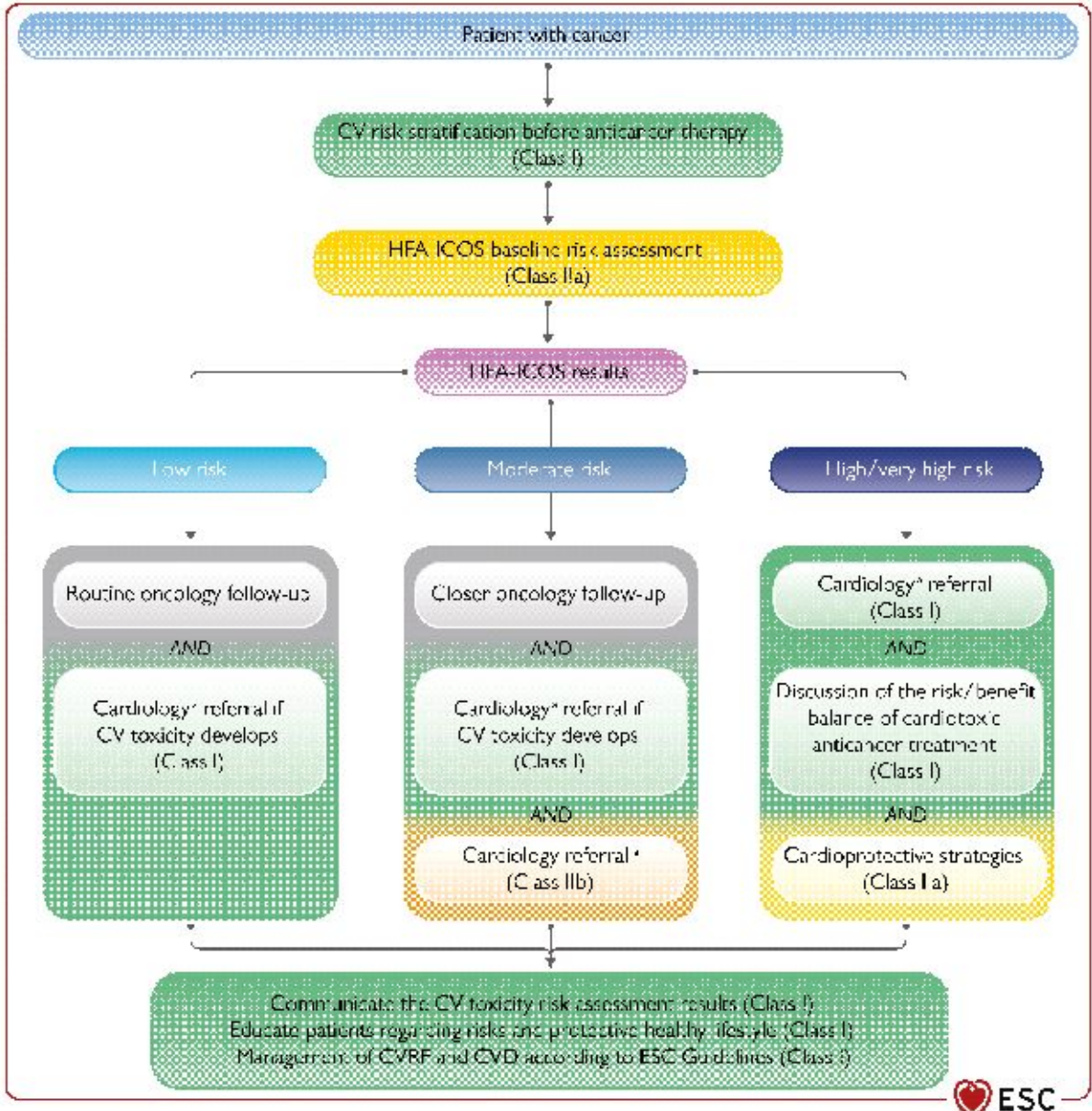












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	Yellow	Light Blue
	Green	Light Blue



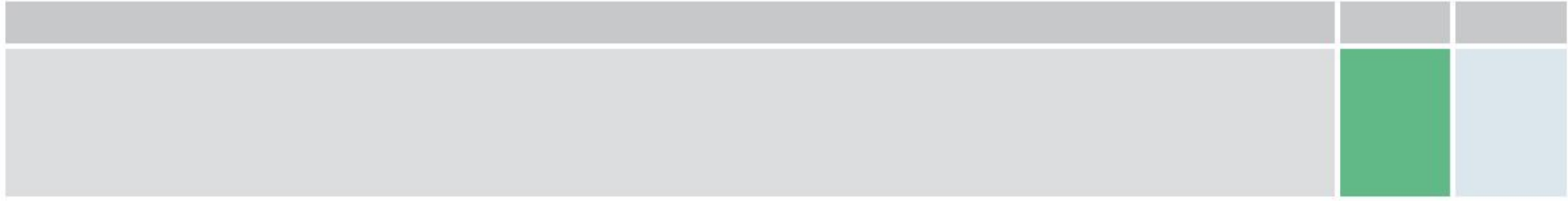
Baseline clinical CV assessment (physical exam and ECG) is recommended in all cancer patients scheduled for cytotoxic therapies.

	Patient risk level	TTE <sup>1</sup>	NP	cTn
Antiarrhythmics	Very high risk Moderate risk	Class I	Class I	Class IIa
HER2-targeted therapies <sup>2</sup>	Very high risk Moderate risk	Class I	Class I	Class IIb
Fluoropyrimidines	Other conditions	Class I		
VEGF	Very high risk Moderate risk Low risk	Class I	Class IIa	Class IIb
Second- and third-generation BCR-ABL1 TKI	Other conditions	Class I		
BTK inhibitors	Very high risk	Class I		
PI3K	Very high risk Moderate risk Low risk	Class I	Class I	
RAF and MEK inhibitors	Very high risk Moderate risk Low risk	Class I	Class IIa	
ICI	Very high risk Other conditions	Class I	Class I	Class I
Quinercetin	Other conditions	Class I		
CAK1 and III	Previous CVD Other conditions	Class I	Class I	Class I
→ to a volume including the heart	Previous CVD	Class IIa		
TSCT	Other conditions	Class I	Class IIa	

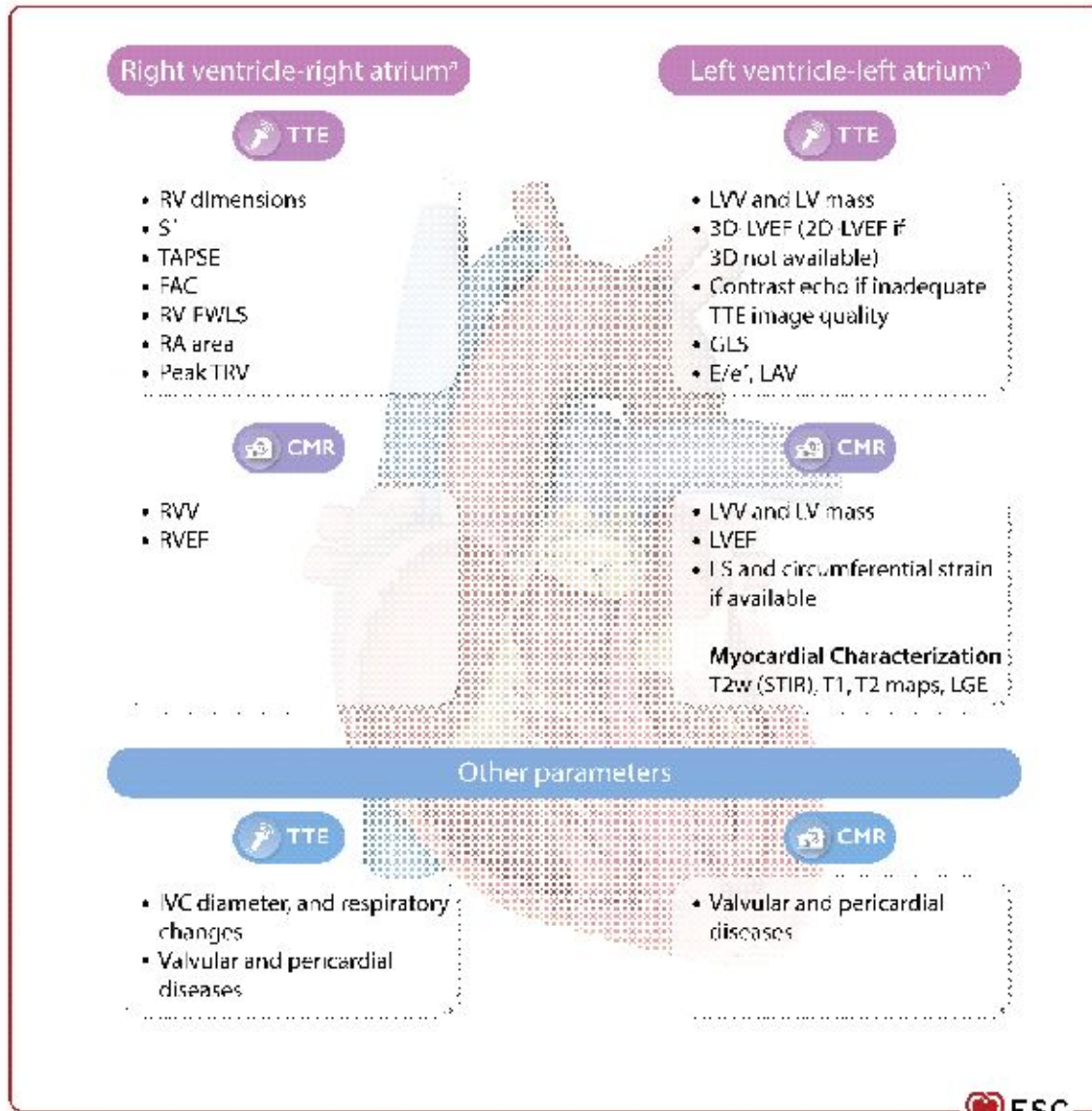
Very high risk  
  Moderate risk  
  Low risk  
  Other conditions  
  Class I  
  Class IIa  
  Class IIb

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	Green	Light Blue









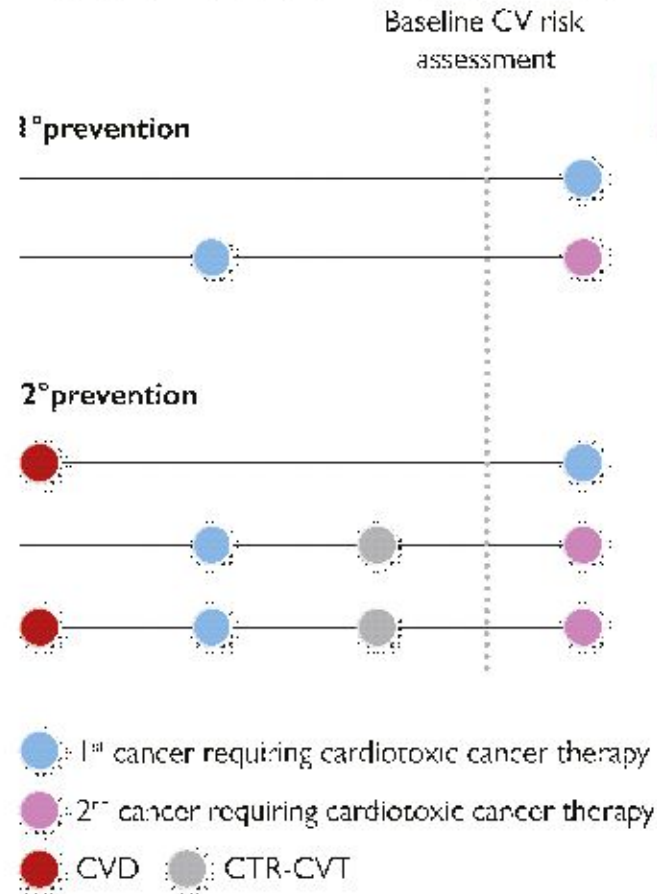







## Primary and secondary cancer-therapy related CV toxicity prevention strategies

### Primary vs secondary prevention



Management of CVD and CVRF according to ESC Guidelines



In patients at high and very high risk of CTRCD

Minimize the use of cardiotoxic drugs

ACE-I/ARB and beta-blockers

Dexrazoxane/liposomal anthracyclines (patients treated with anthracyclines)

Statins



Class I



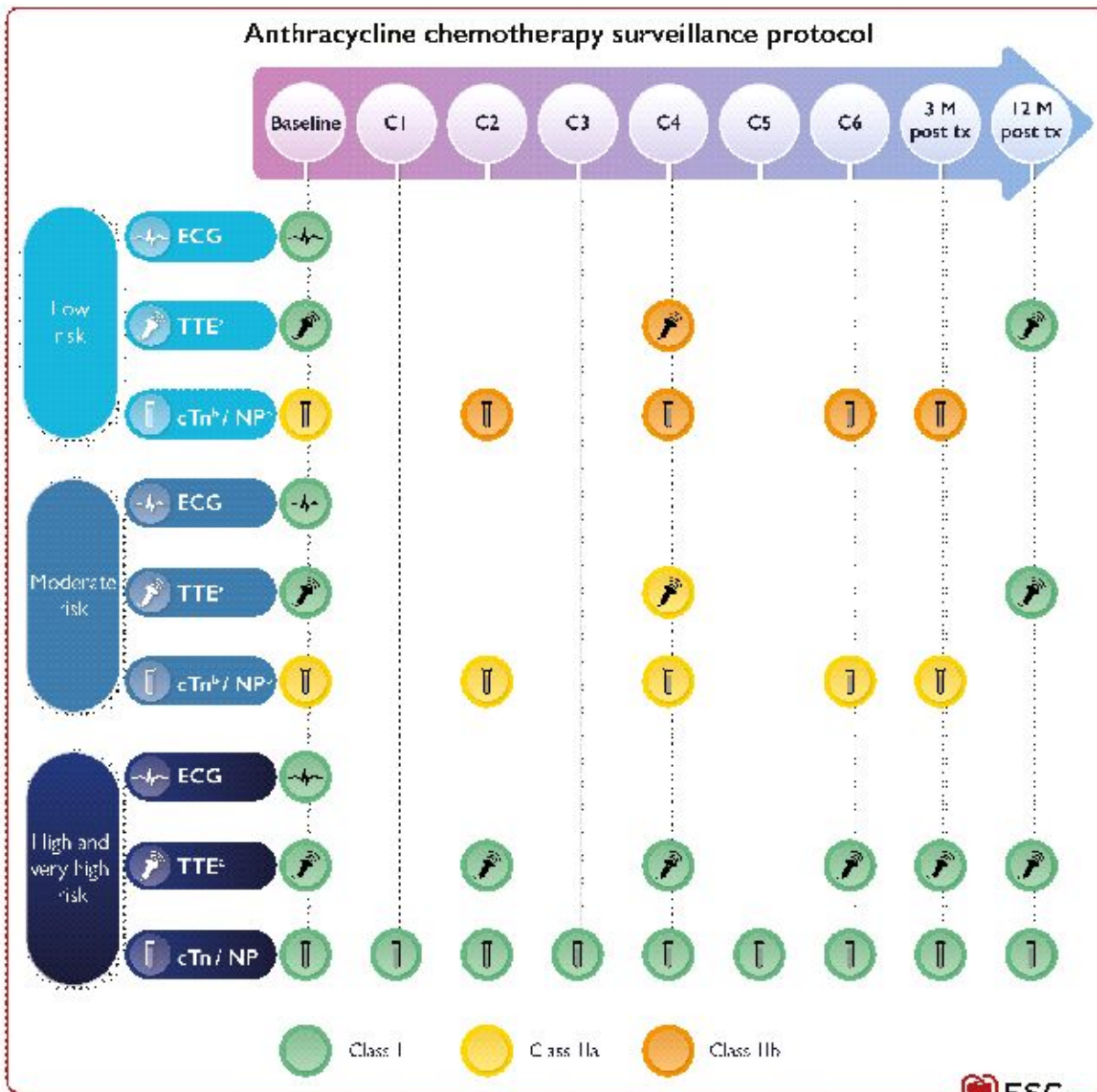
Class IIa







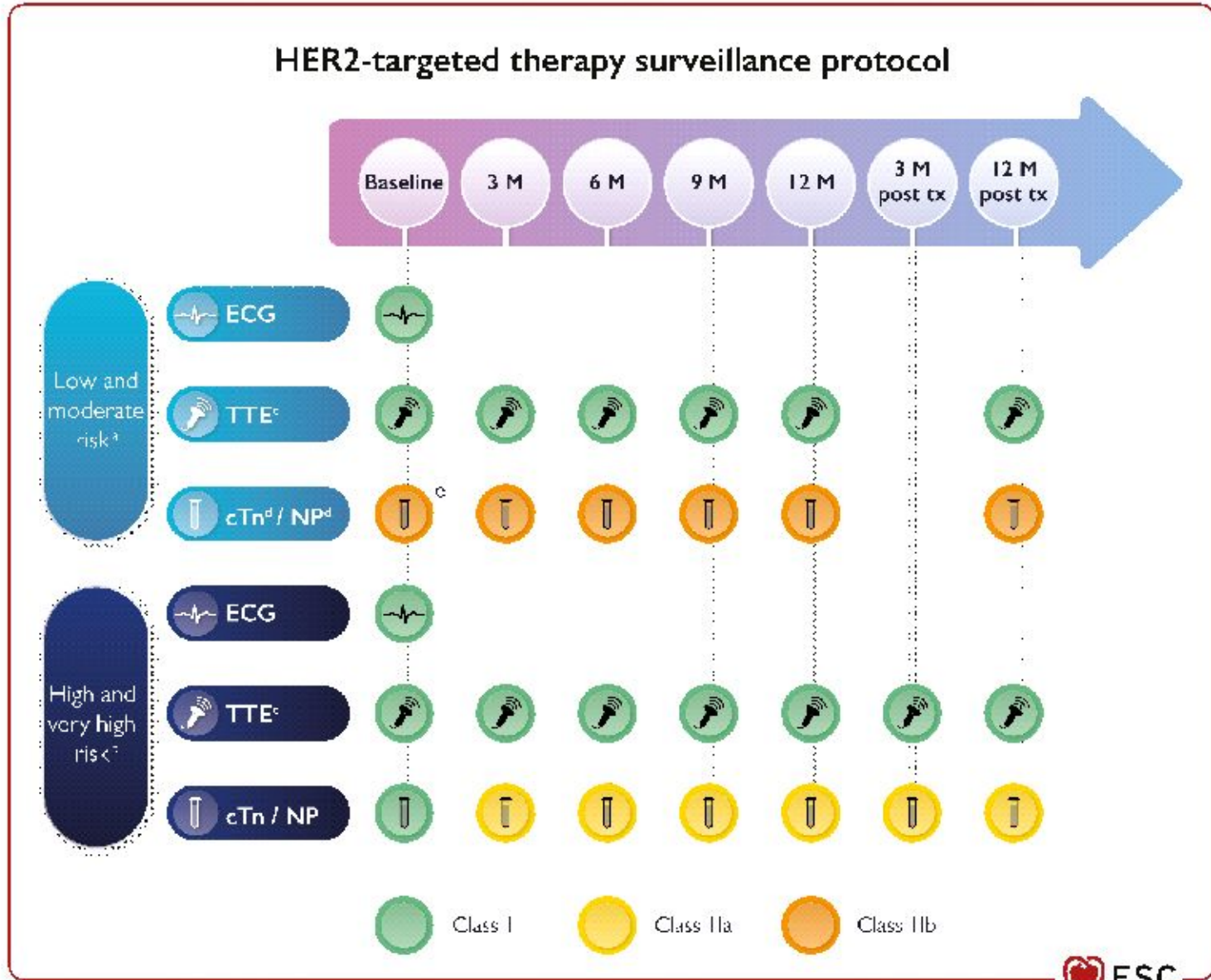
# Anthracycline chemotherapy surveillance protocol







# HER2-targeted therapy surveillance protocol







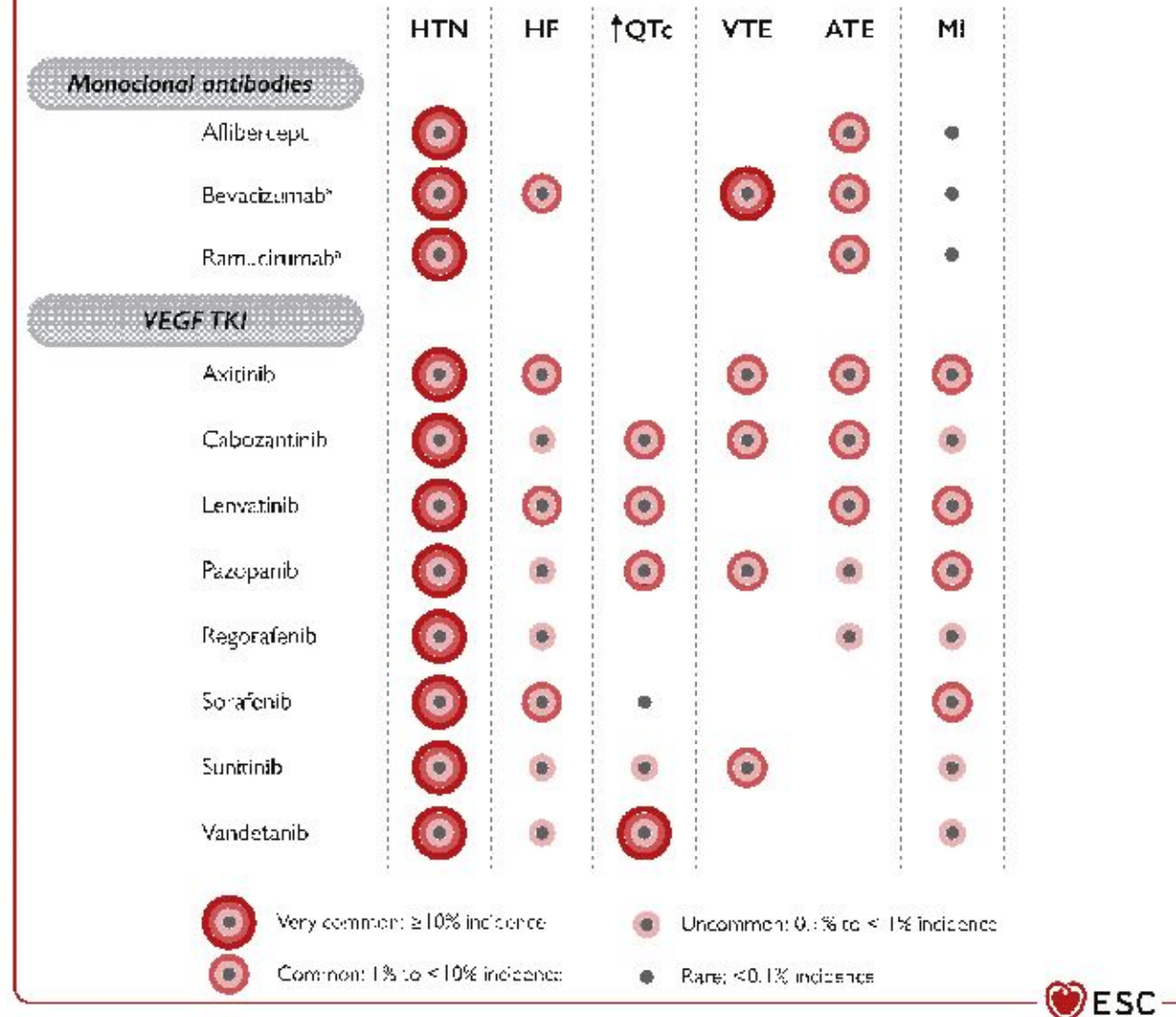




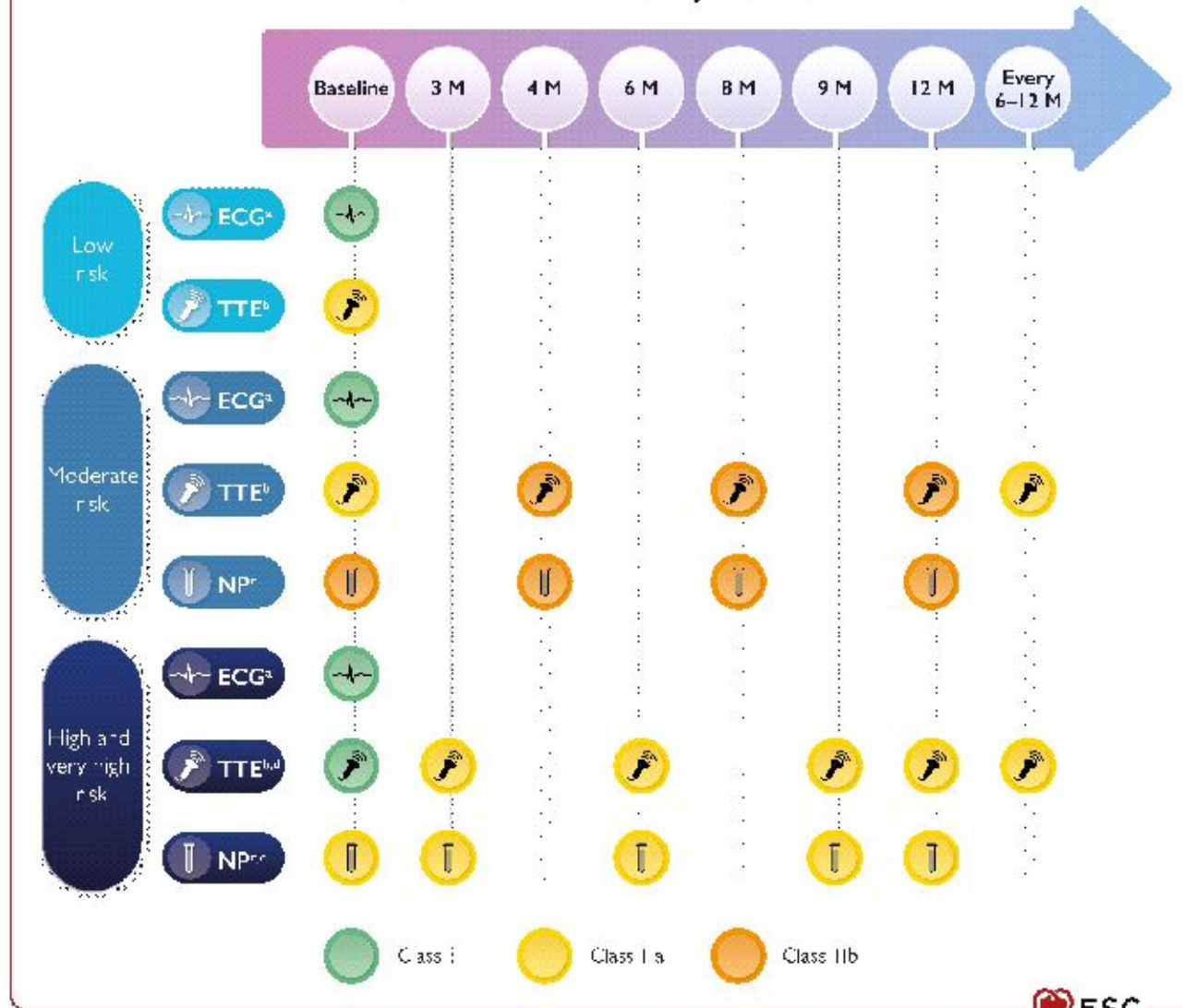
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	Orange	Light Blue



### VEGFi-related cardiovascular toxicities



## VEGFi surveillance protocol

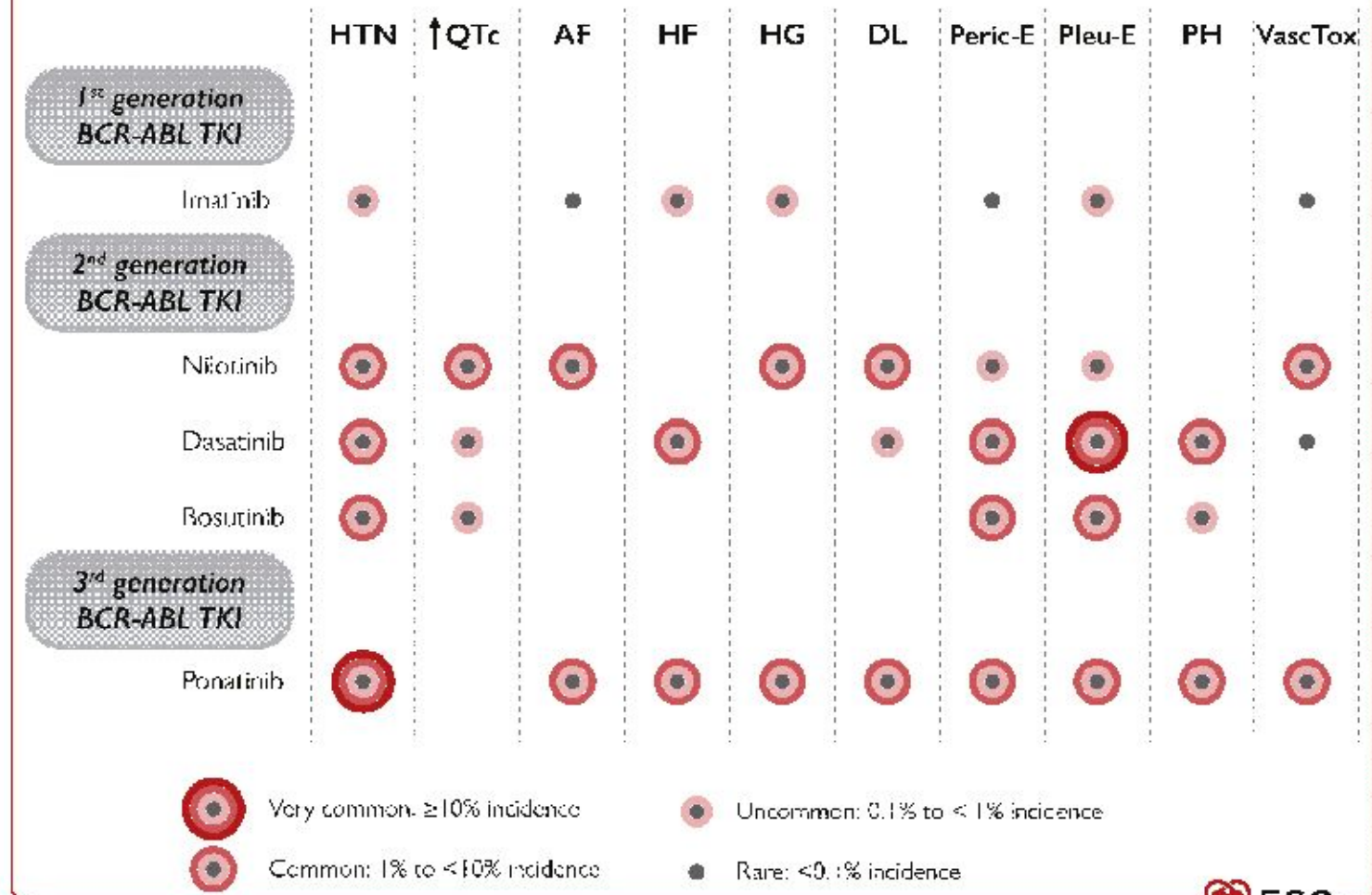




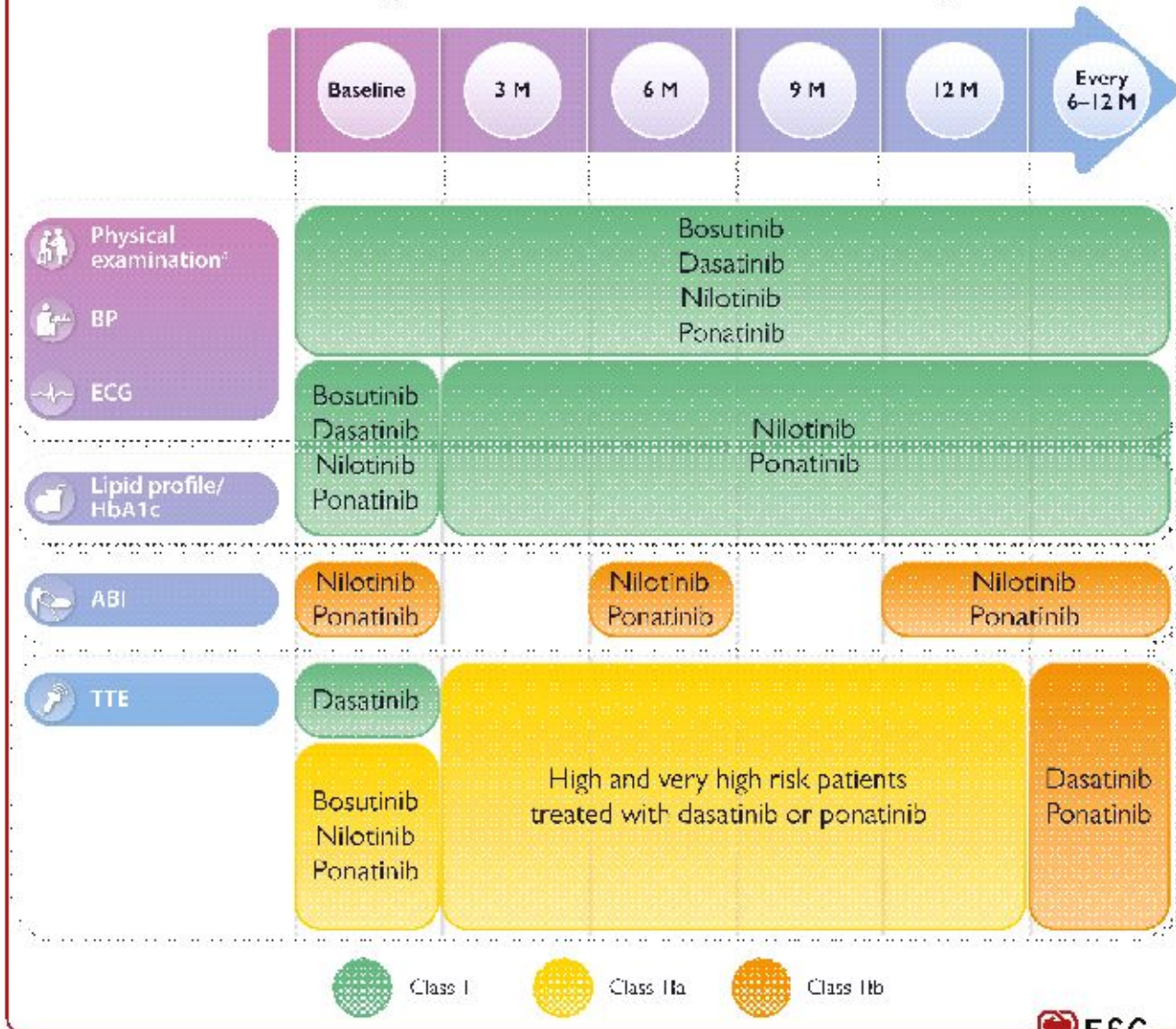




### BCR-ABL TKI-related cardiovascular toxicities



## Second and third generation BCR-ABL TKI surveillance protocol



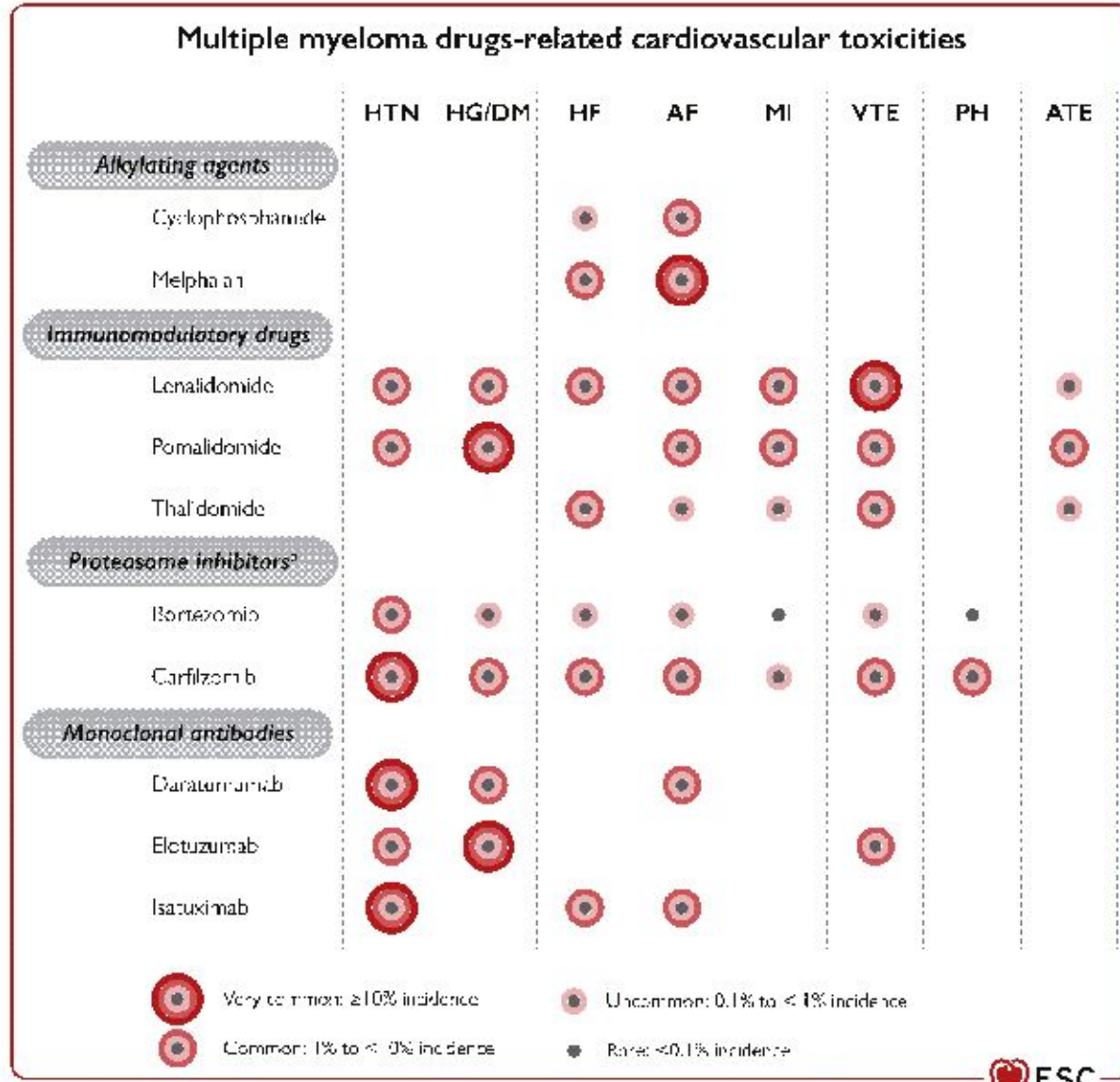
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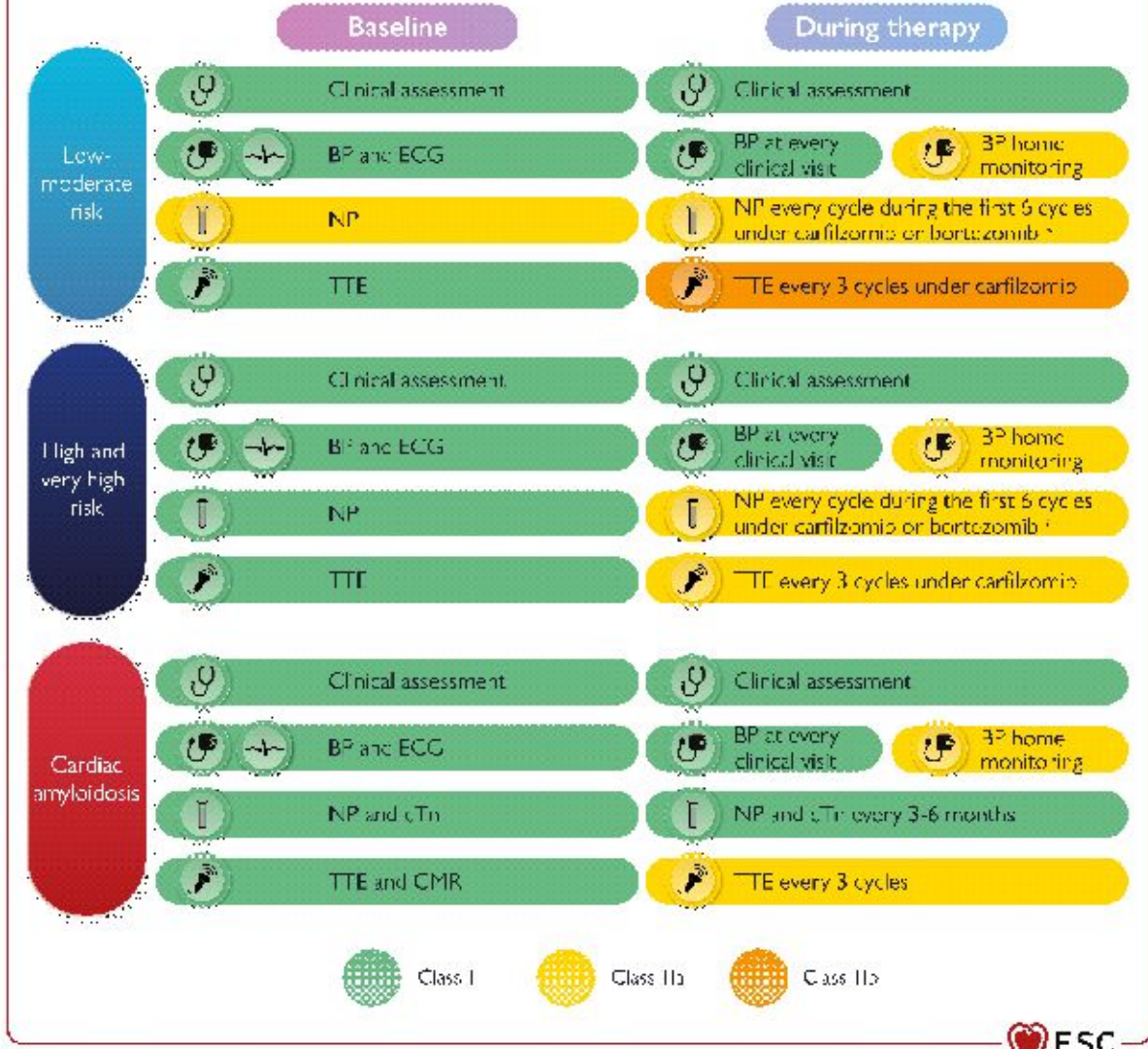








### Proteasome inhibitors surveillance protocol



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	Yellow	Light Blue
	Green	Light Blue
	Yellow	Light Blue
	Yellow	Dark Blue
	Green	Dark Blue





## Risk factors for venous thromboembolic events in patients with multiple myeloma

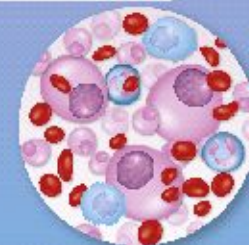
### Patient-related risk factors

- Previous VTE
- Acute infections
- Autoimmune disease
- Central venous catheter
- Chronic renal disease
- Cigarette smoking
- CVD
- DM
- General surgery
- History of inherited thrombophilia
- Immobilization, surgery, trauma
- Obesity (BMI >30 kg/m<sup>2</sup>)

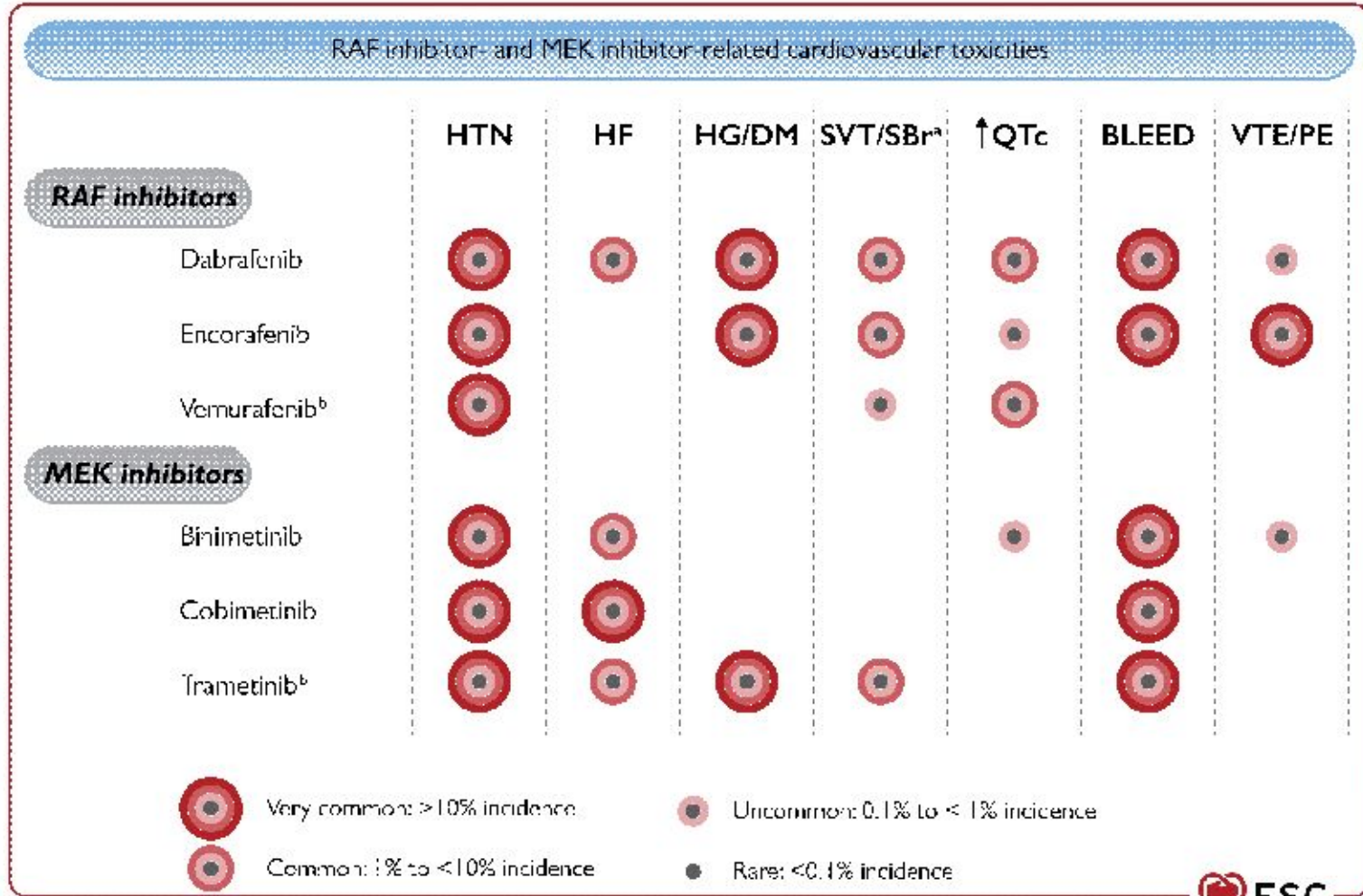


### Myeloma-related risk factors

- Advanced disease status
- Erythropoietin-stimulating agents
- High dexamethasone doses
- Hyper-viscosity state
- Thalidomide/lenalidomide/ponalidomide



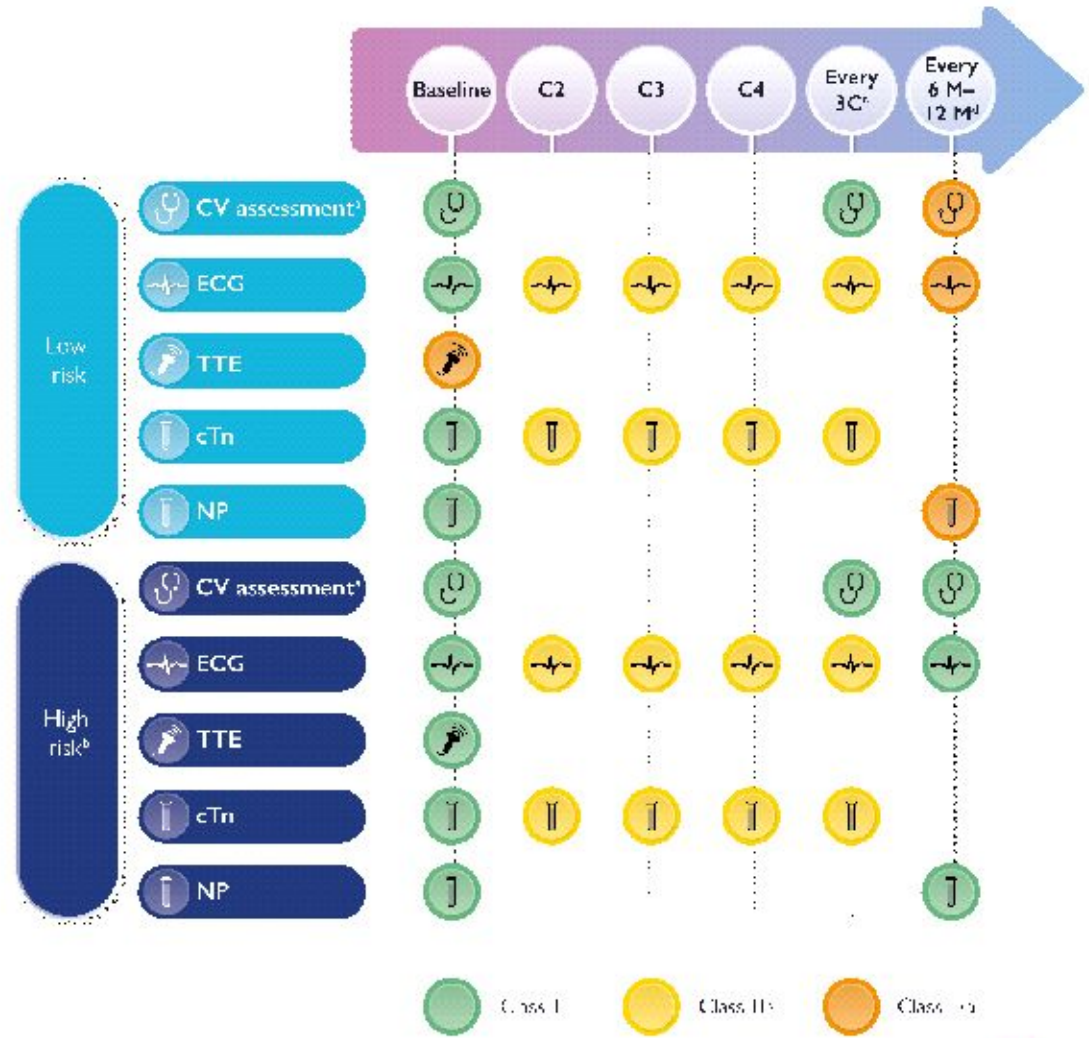




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	Green	Light Blue
	Orange	Light Blue
	Yellow	Light Blue





	Green	Blue
	Green	Blue
	Orange	Light Blue
	Yellow	Blue
	Green	Light Blue
	Orange	Light Blue

# Immune checkpoint inhibitors surveillance protocol



### Androgen deprivation therapy-related cardiovascular toxicities

	HTN	HG/DM	HF	IHD/MI	AF	↑QTc
<b>GnRH agonist</b>						
Goserelin	•	⊙	⊙	⊙		•
Fistralin		⊙				•
Leuprolerin	•					•
Triptorelin	⊙	•				•
<b>GnRH antagonist</b>						
Degarelix	•	•	•	•	•	•
Kelufolix		⊙	•	•		•
<b>1<sup>st</sup> generation antiandrogens</b>						
Firaparantse	⊙	⊙	⊙	⊙		•
Flutamide	•					•
Nitrofurantoin	⊙	⊙	⊙	⊙		•
<b>2<sup>nd</sup> generation androgen deprivation therapy</b>						
Apalutamide	⊙	⊙	⊙	⊙		•
Enzalutamide	•		⊙	⊙		•
Ezalutamide	⊙			⊙		•
<b>Androgen metabolism inhibitor</b>						
Abiraterone <sup>a</sup>	⊙	⊙	⊙	⊙	⊙	•

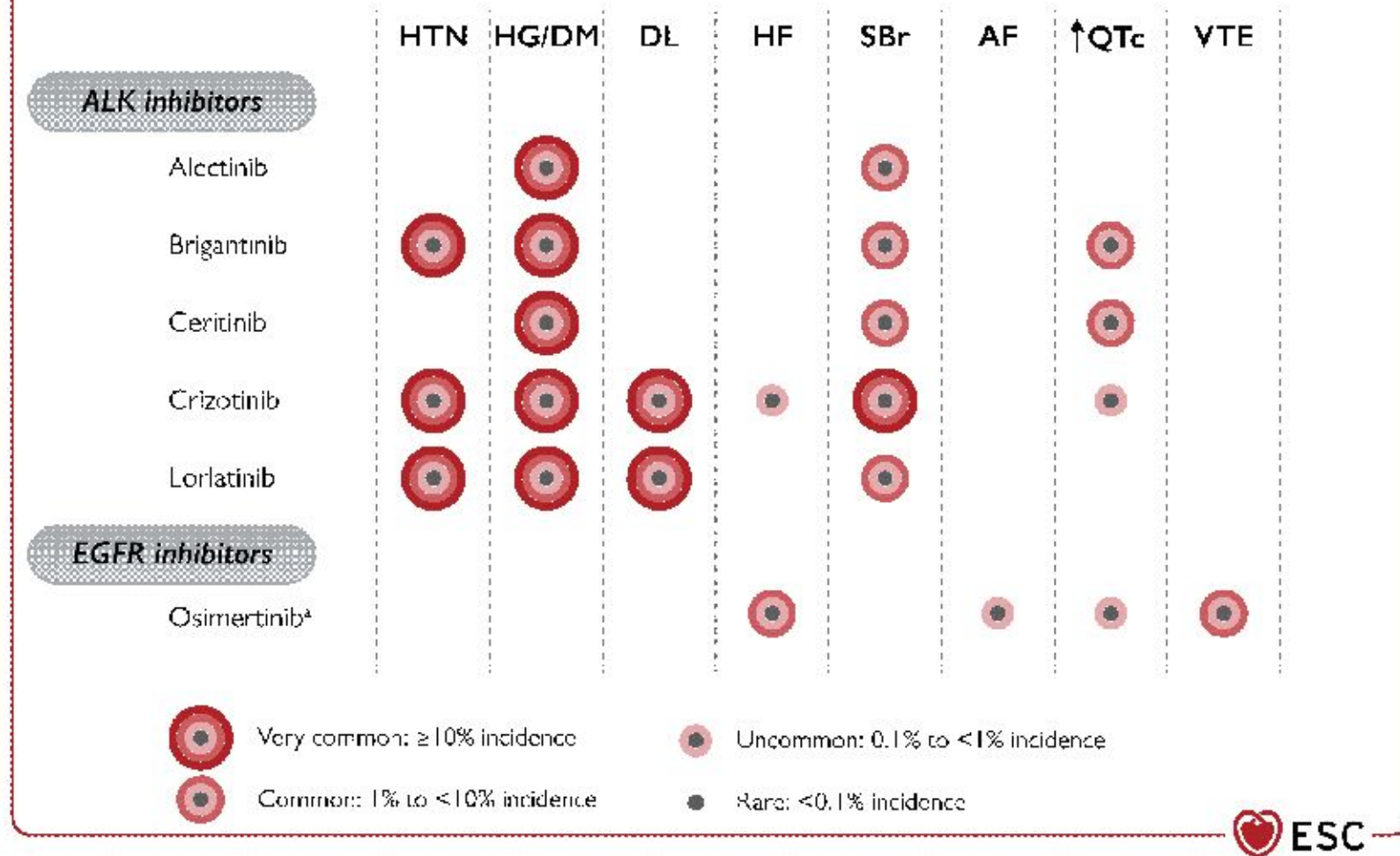
 Very common: ≥ 10% incidence  
 Common: 1% to < 10% incidence  
 Uncommon: > 1% to < 10% incidence  
 Rare: < 1% incidence





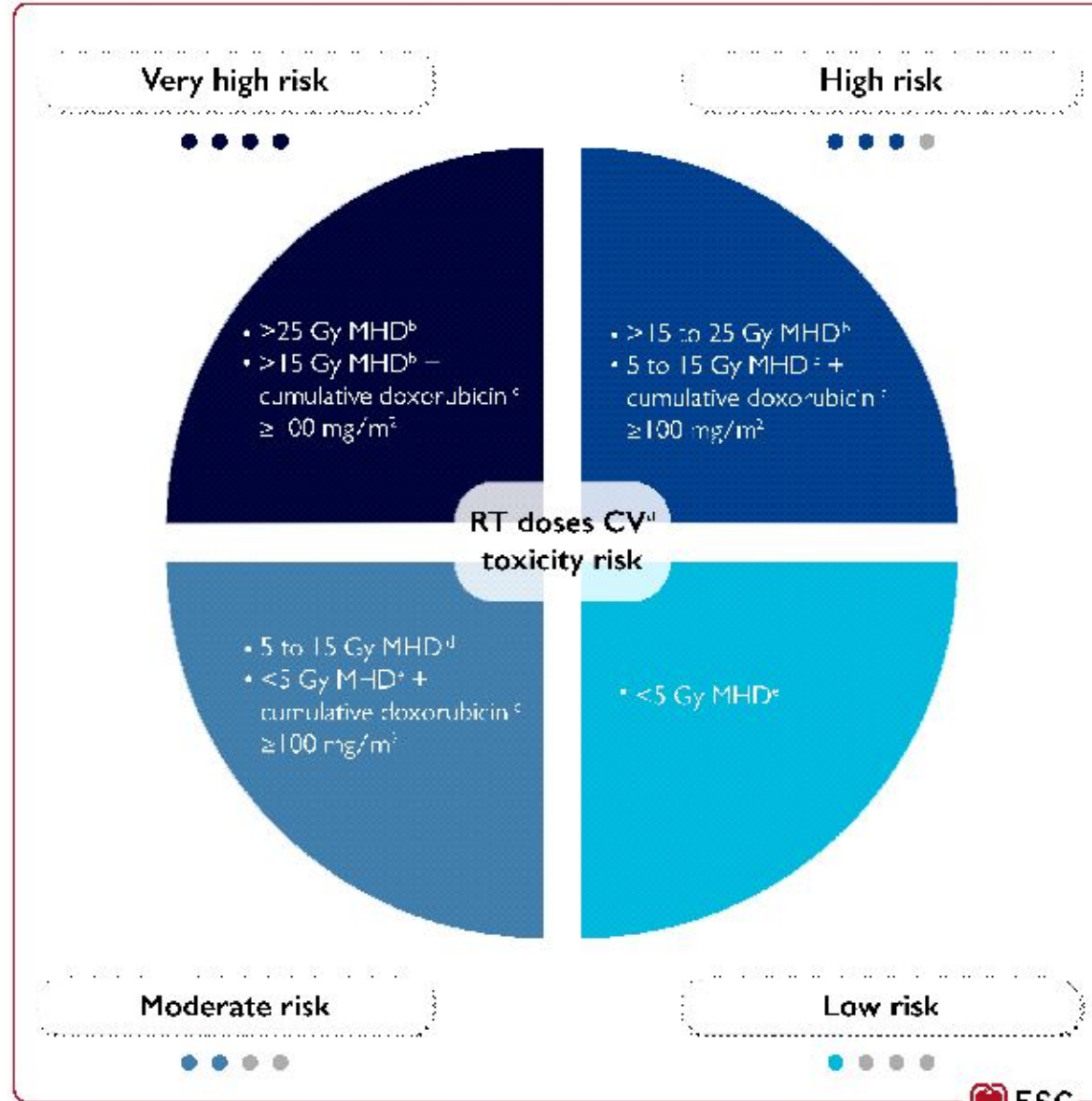



### ALK inhibitor- and EGFR inhibitor-related cardiovascular toxicities

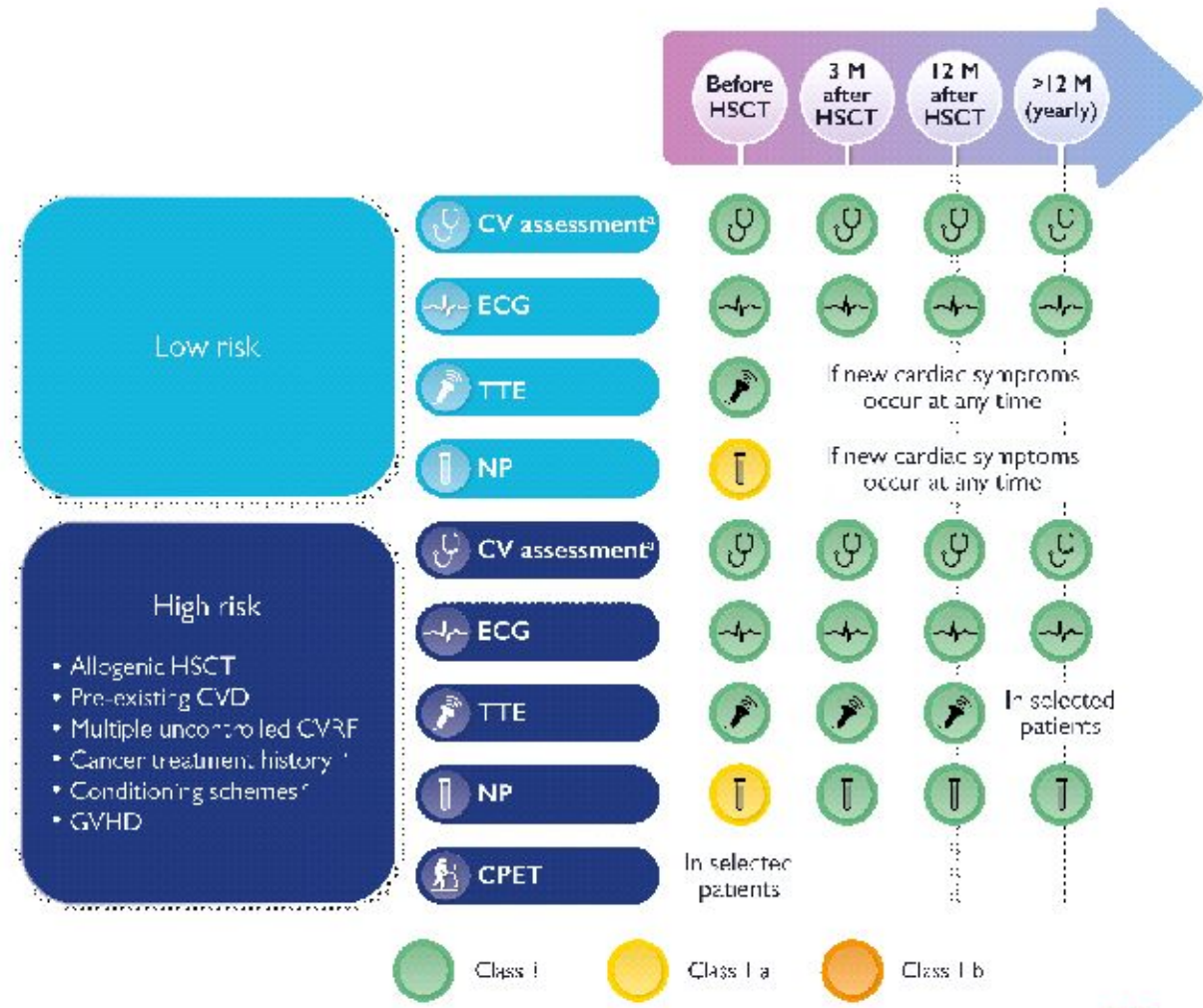




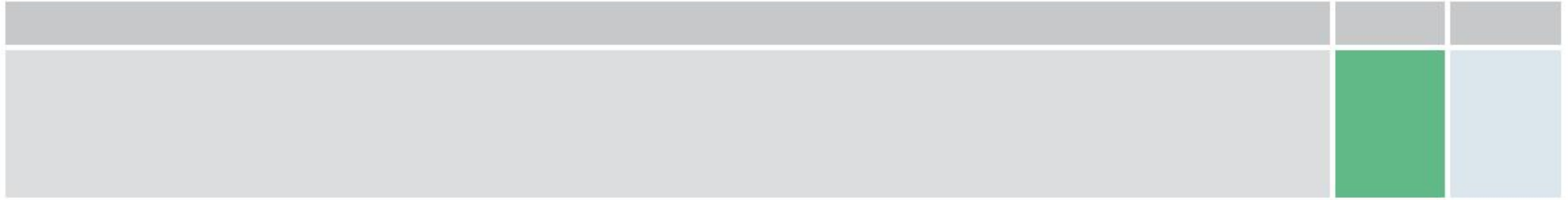




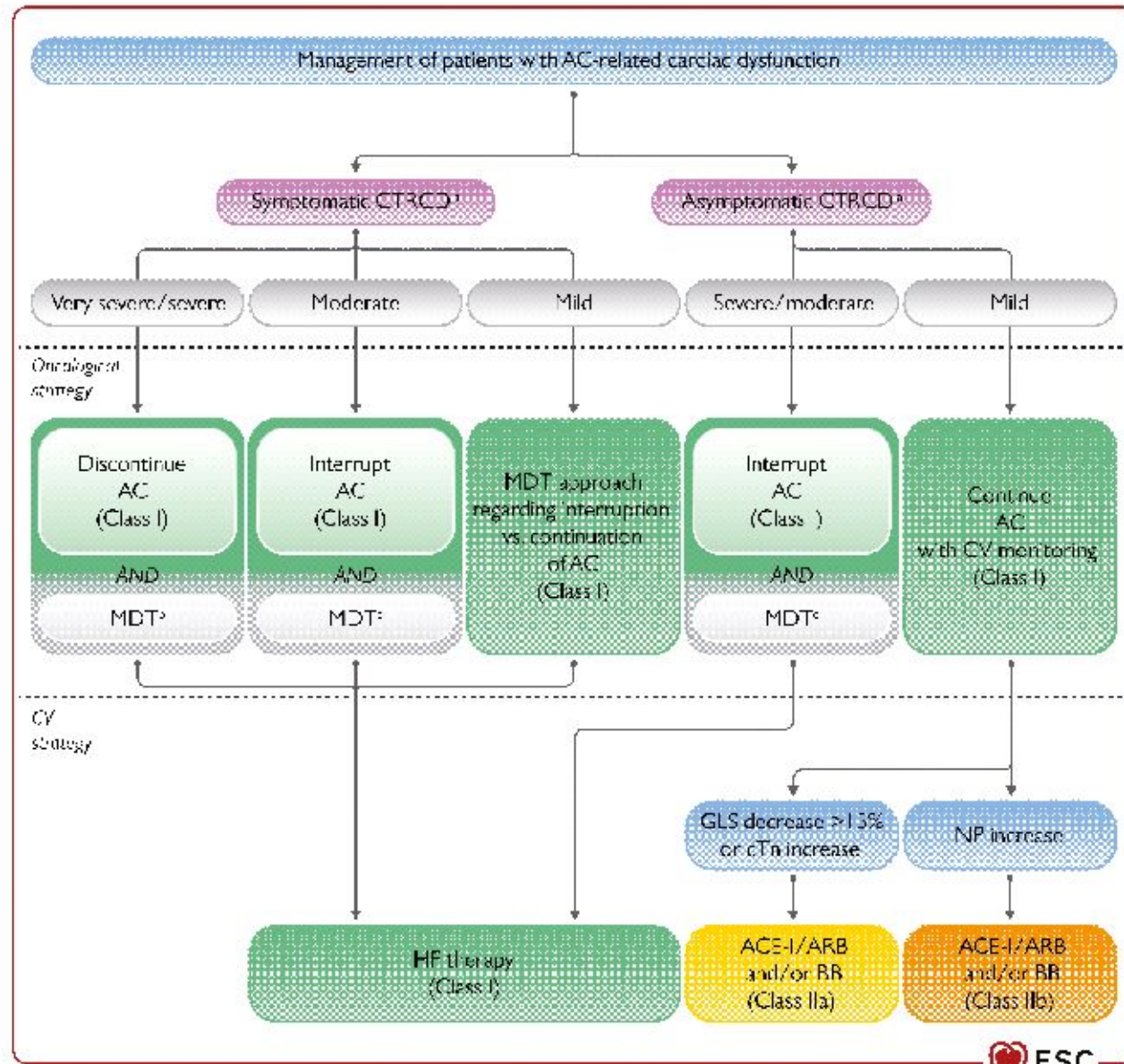

## Cardiovascular surveillance in patients referred for haematopoietic stem cell transplantation







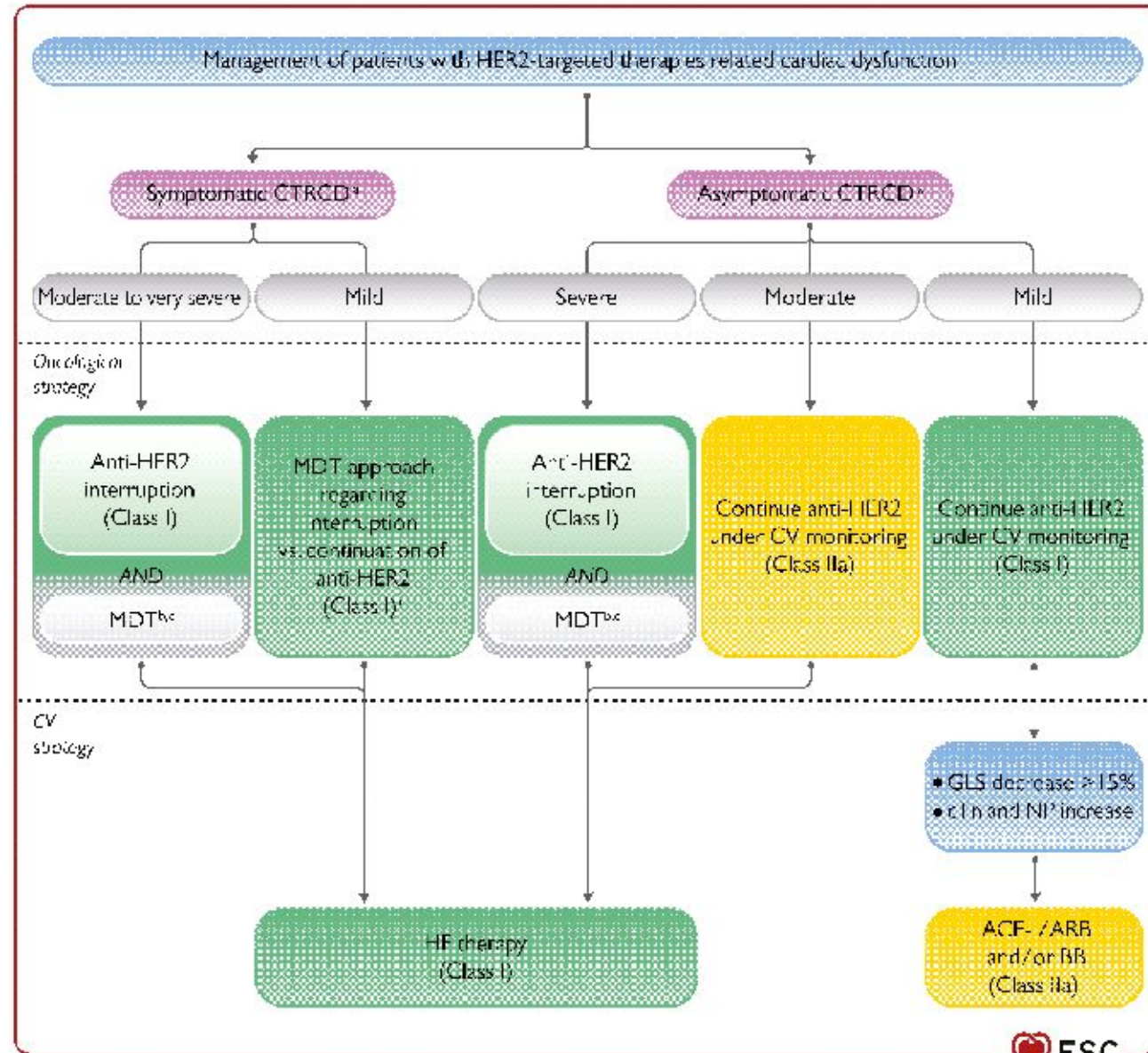








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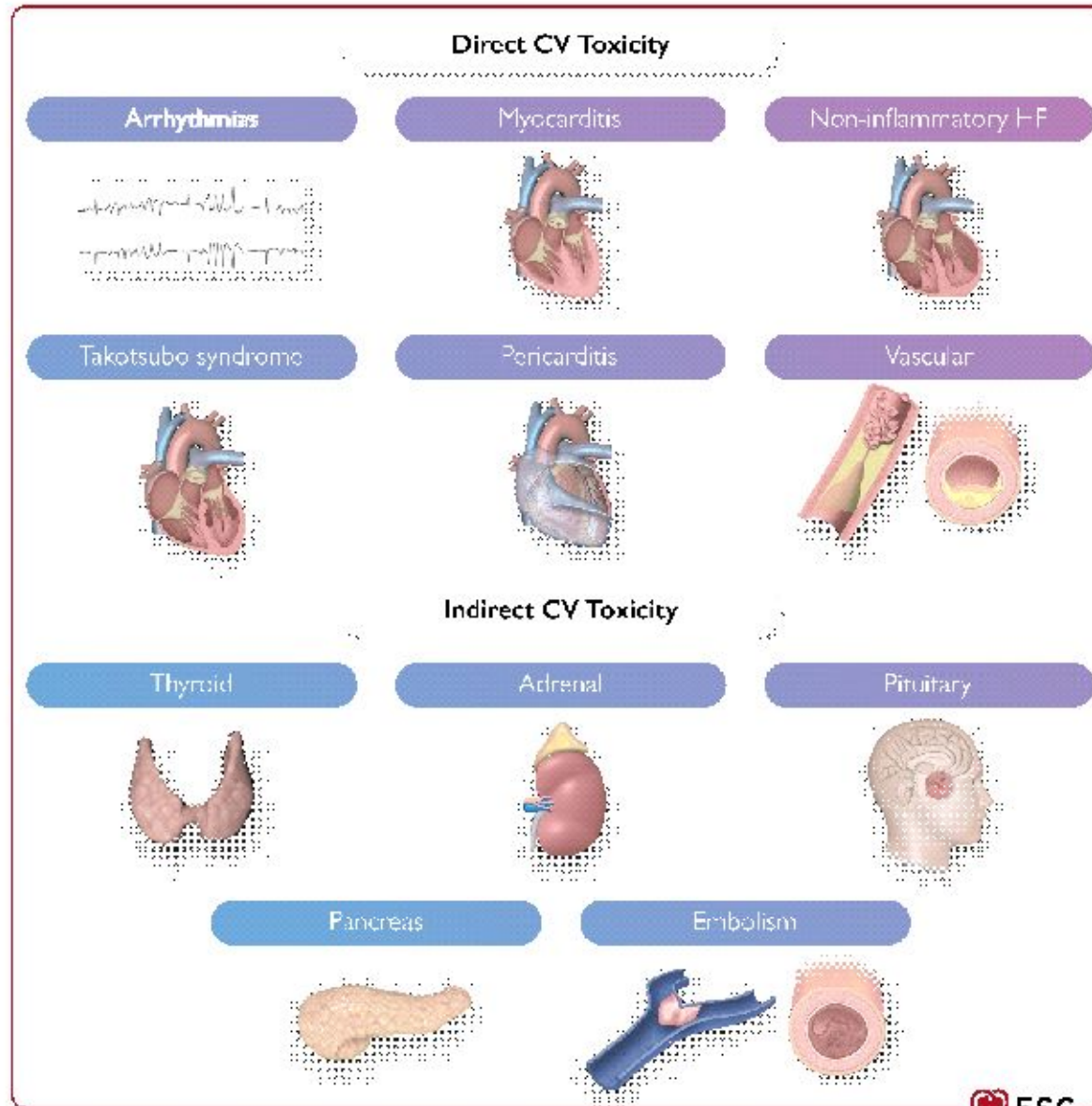


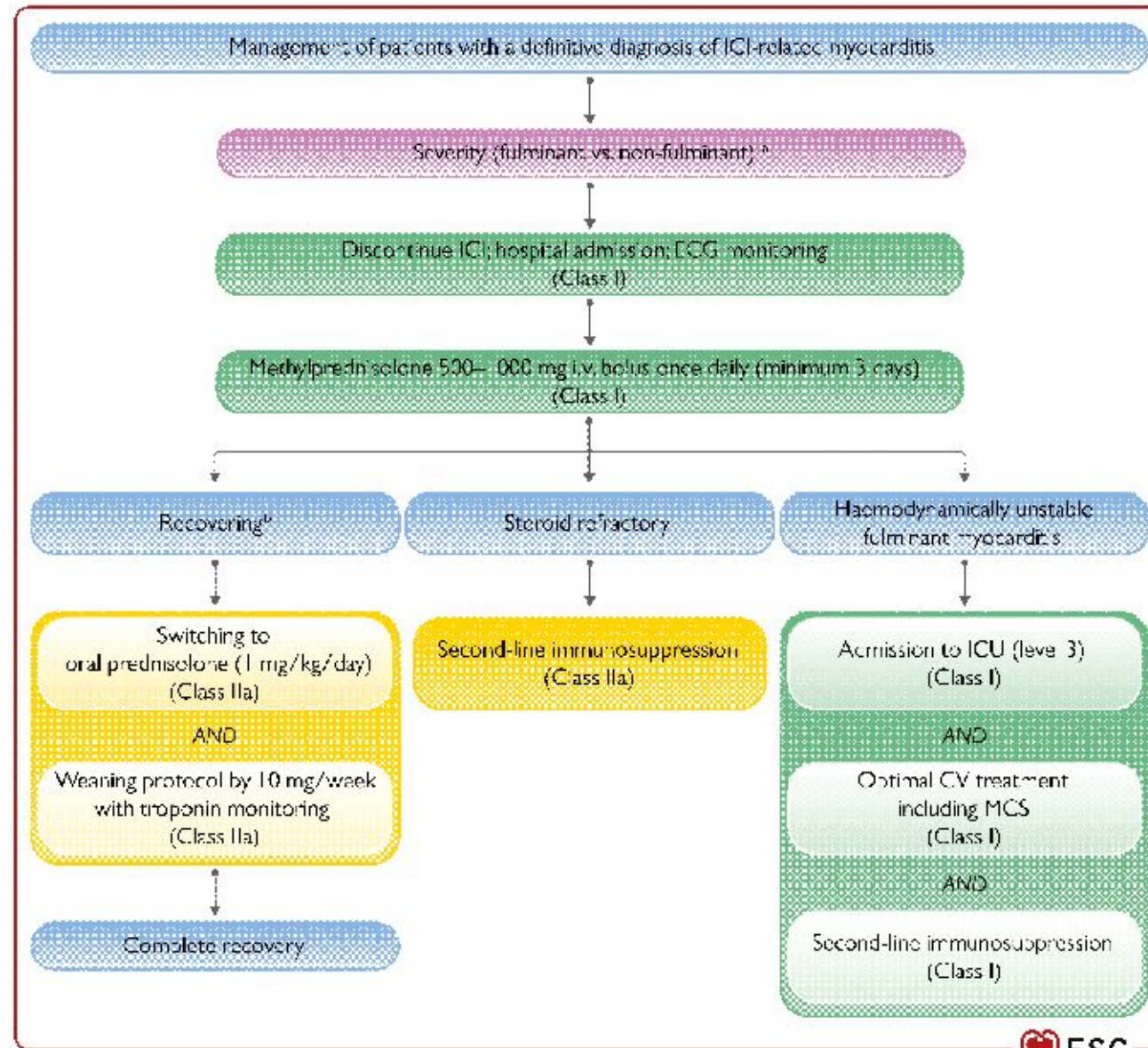










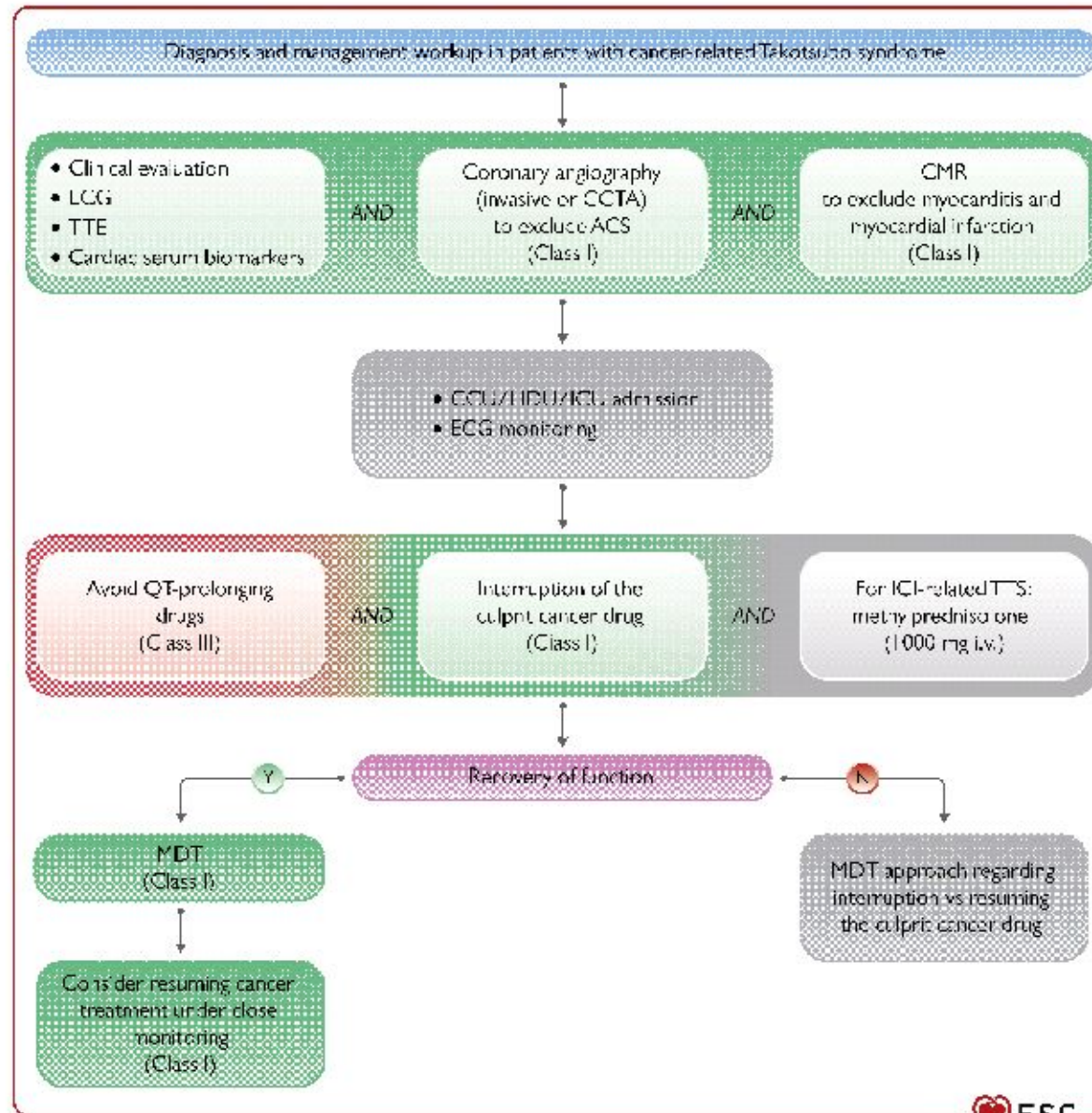










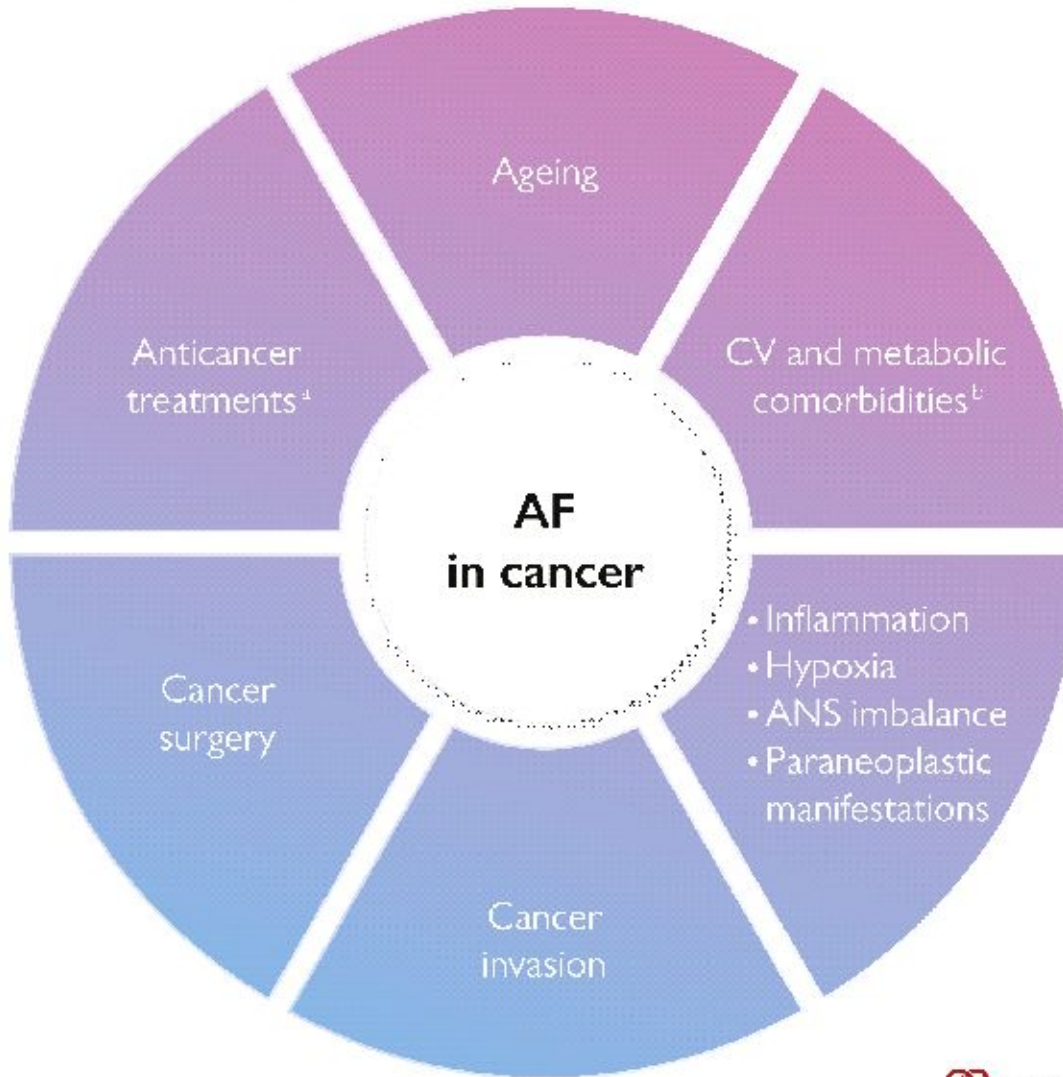



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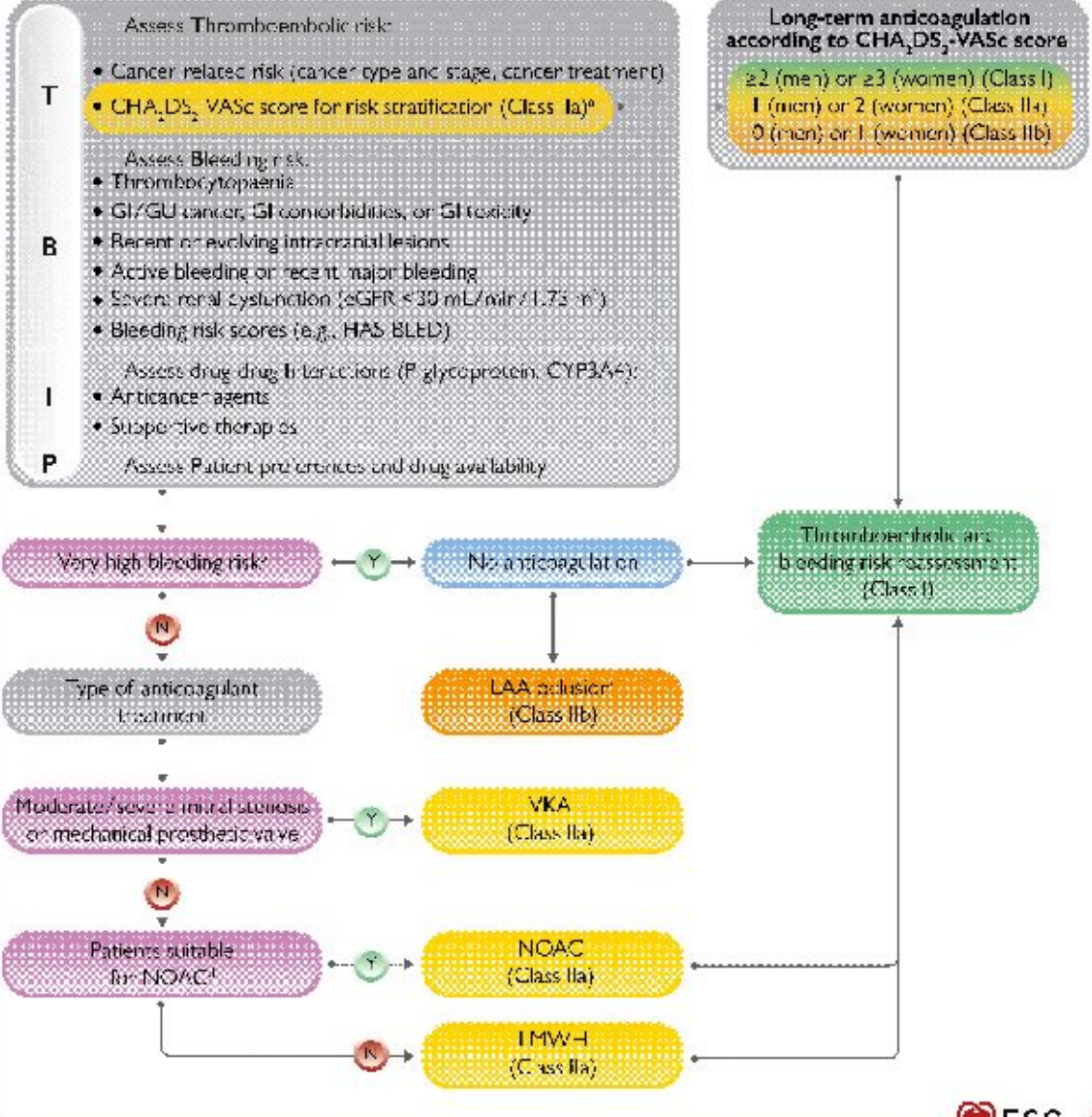





## Pathophysiology of AF associated with cancer



Structured approach to anticoagulation for AF in patients with cancer







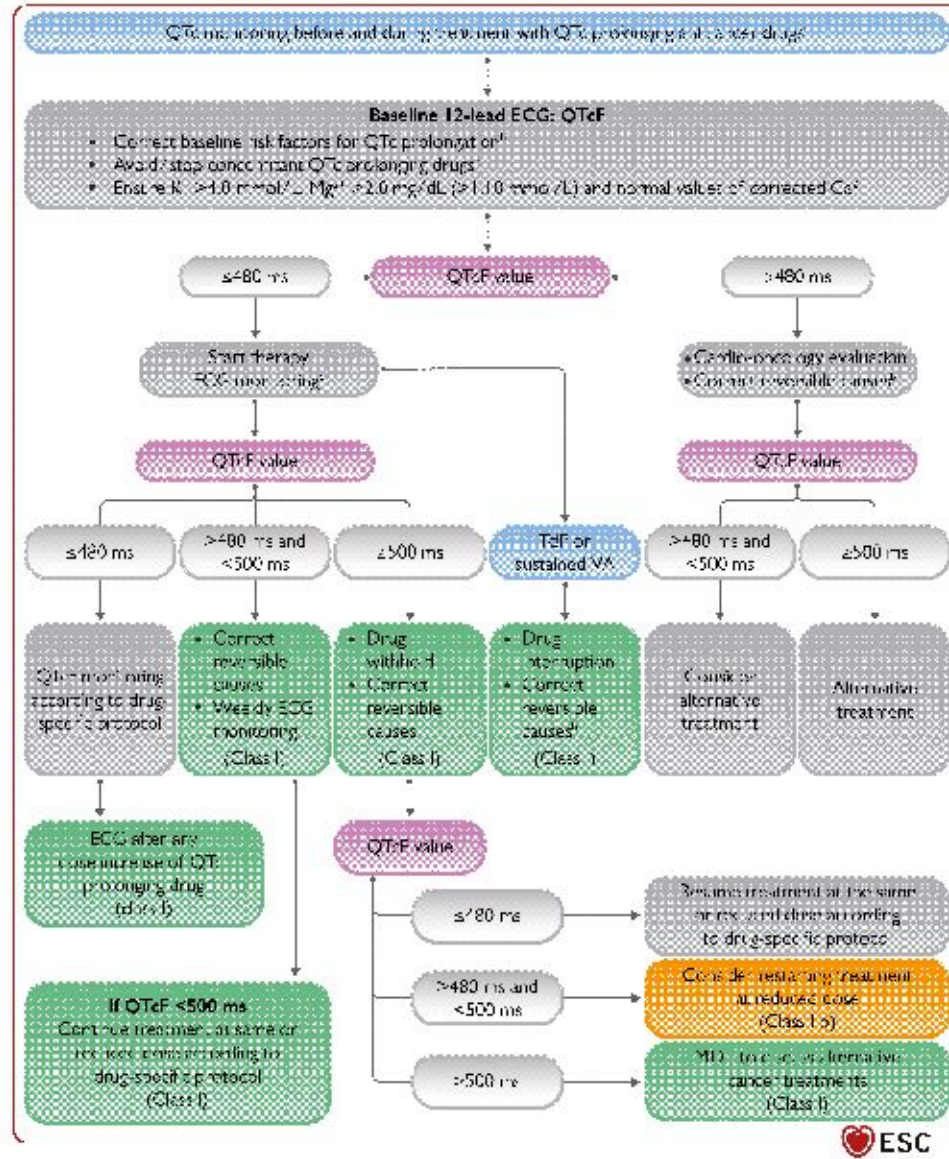








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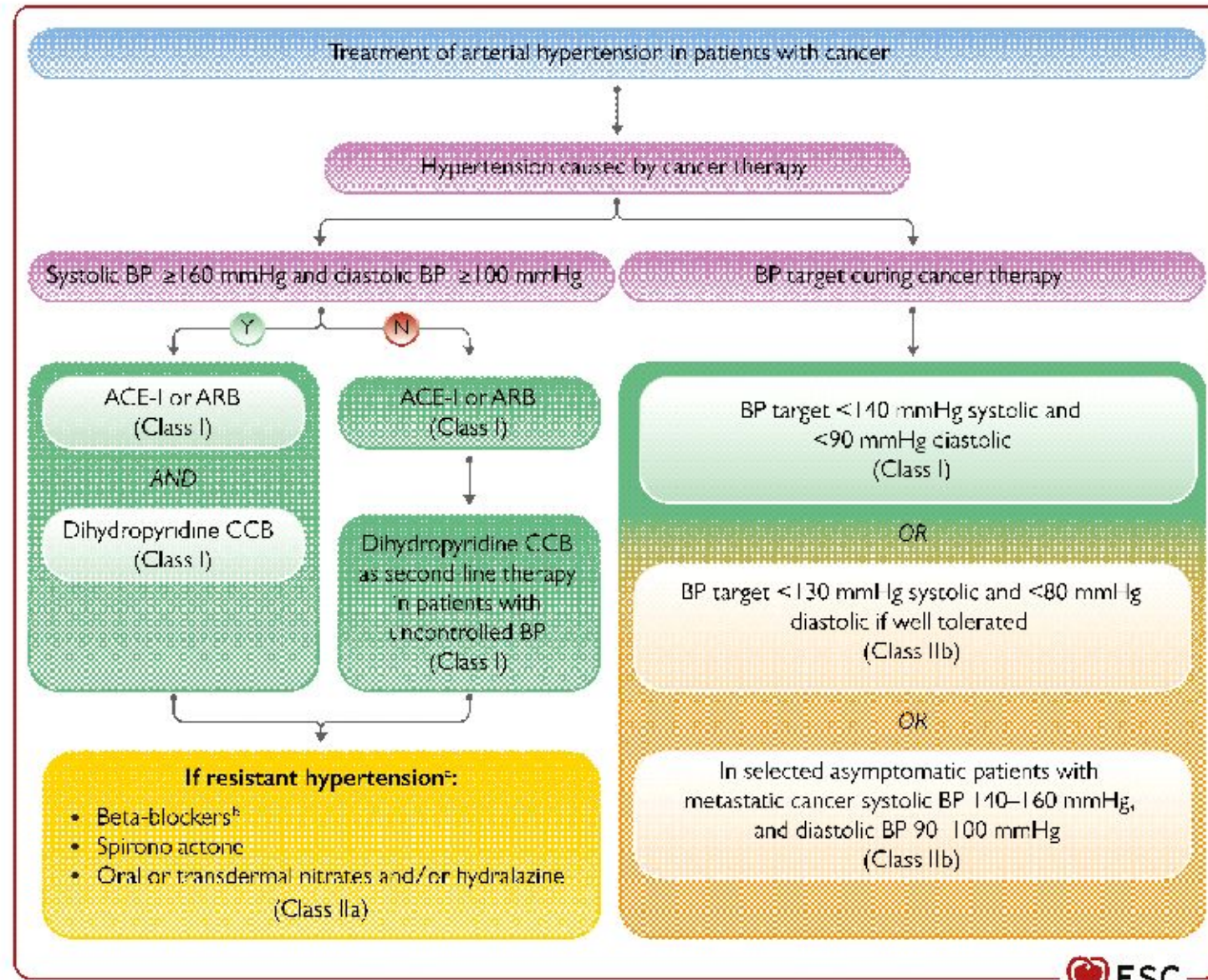


## Recommended threshold for asymptomatic hypertension treatment in different clinical scenarios

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









## Risk factors for VTE in patients with cancer

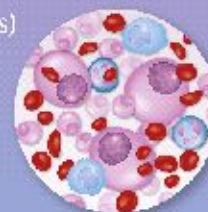
### Patient-related factors

- Ageing
- Comorbidities<sup>a</sup>
- Sex (female)
- Hereditary coagulation defects<sup>b</sup>
- Performance status
- Prior VTE history



### Cancer-related factors

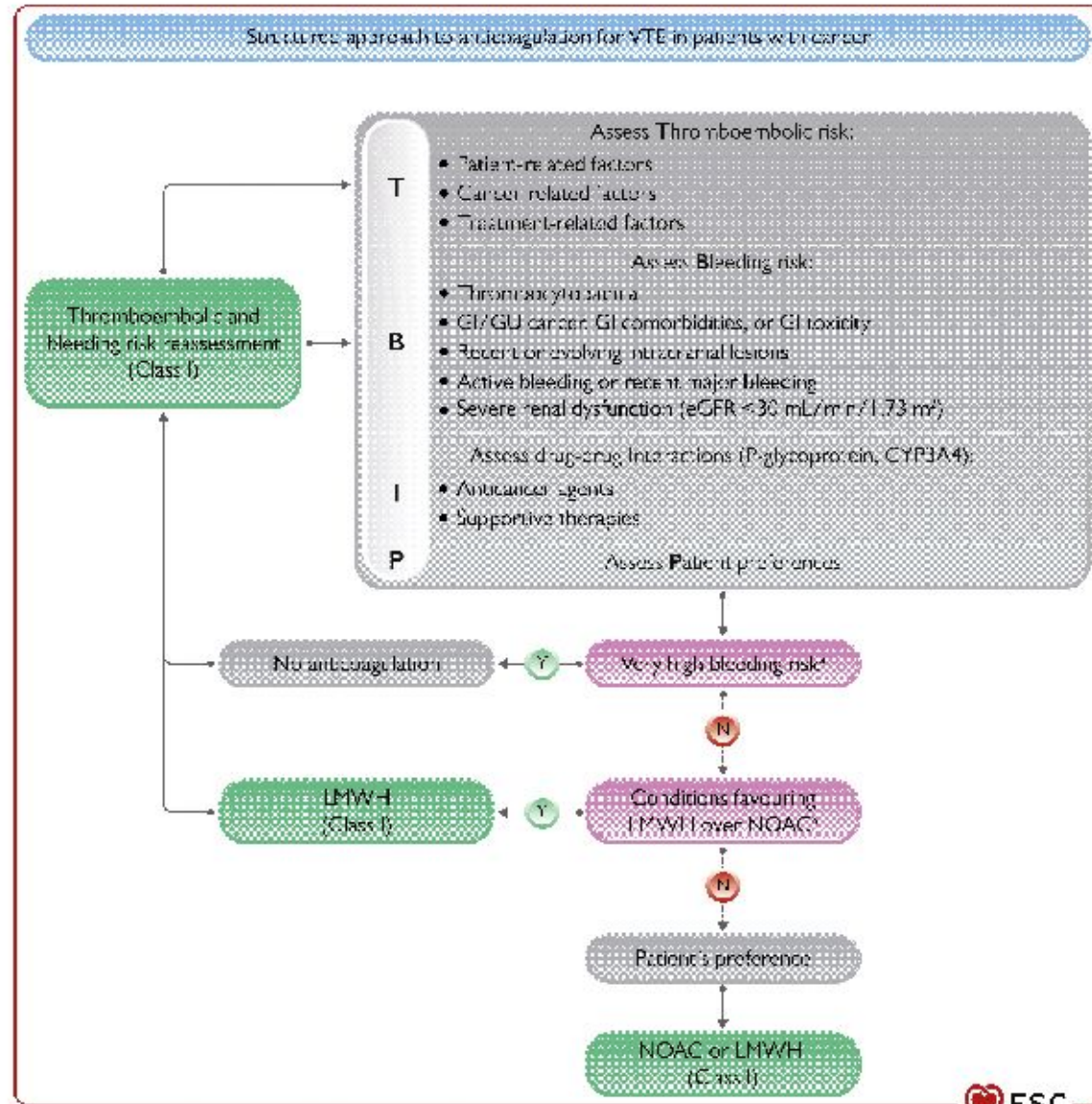
- Cancer type
- Genetic characteristics (JAK2 or K-ras mutations)
- Histology (adenocarcinoma)
- Initial period after diagnosis
- Primary site (pancreas, stomach, ovaries, brain, lung, myeloma)
- Stage (advanced, metastatic)



### Treatment-related factors

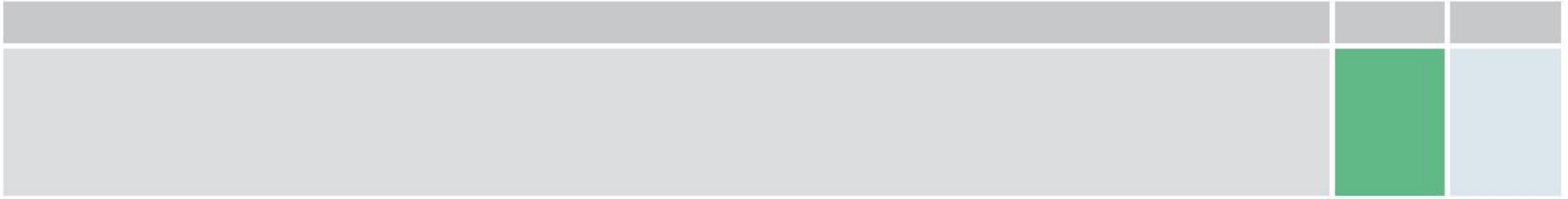
- Cancer therapy<sup>c</sup>
- Central venous catheters
- Hospitalization
- Major surgery





	Green	Teal
	Green	Teal
	Orange	Light Blue
	Yellow	Teal
	Green	Light Blue





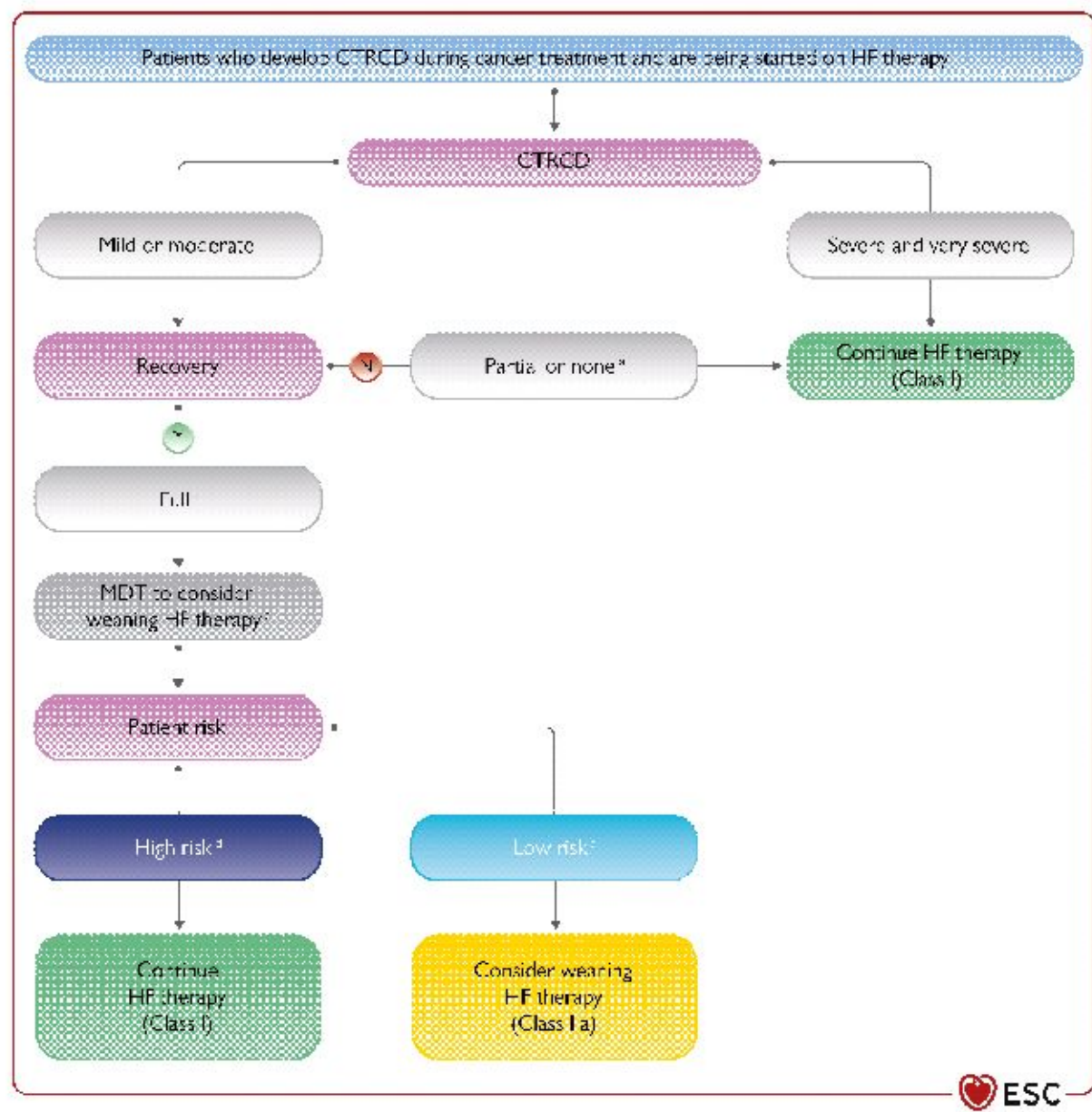




















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	Yellow	Blue
	Yellow	Blue

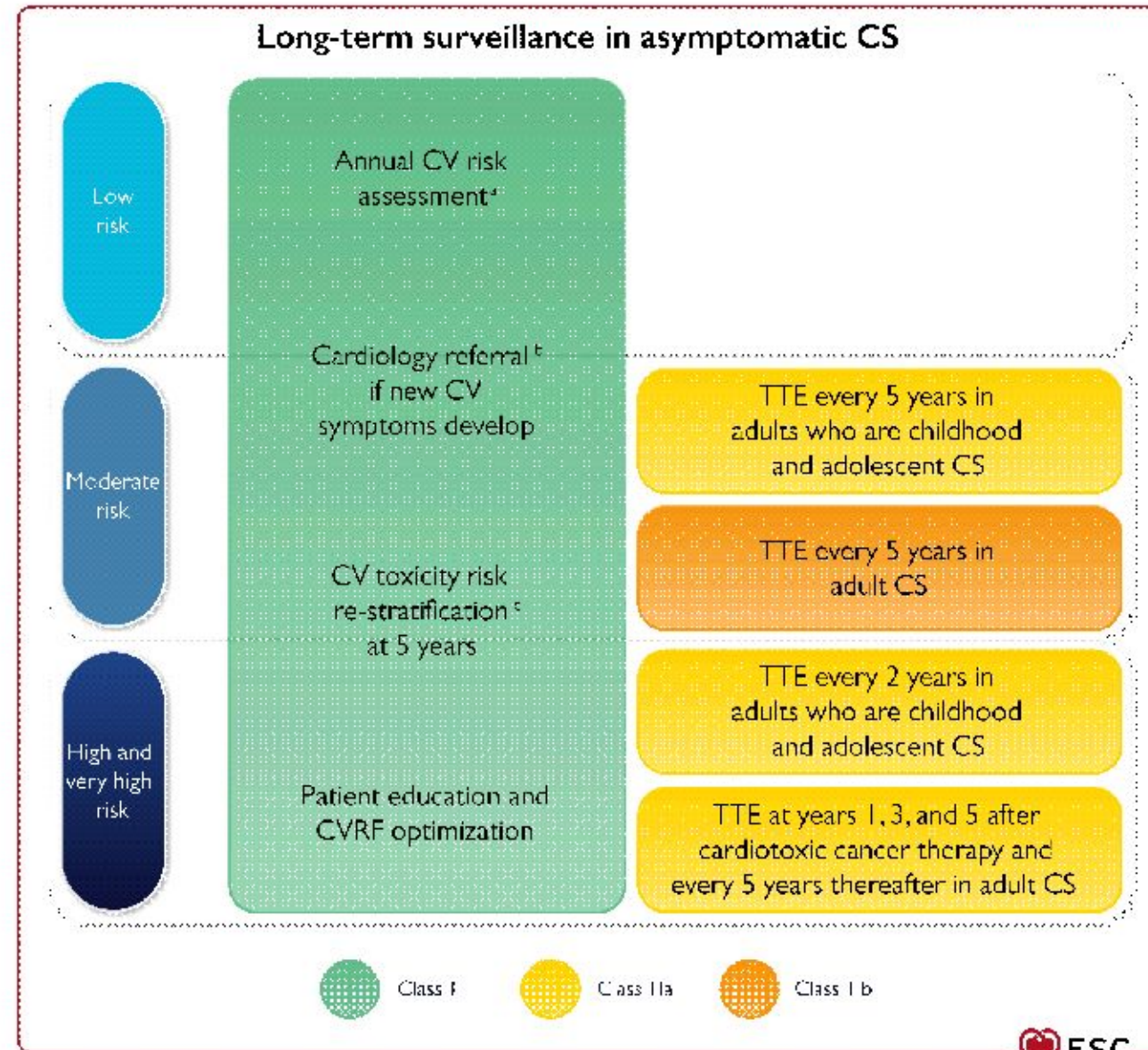
				I















	Green	Light Blue
	Green	Light Blue
	Green	Light Blue
	Orange	Blue




	Green	Light Blue
	Green	Light Blue
	Yellow	Light Blue
	Green	Light Blue
	Yellow	Light Blue

**Pulmonary artery**

- Sarcoma

**Right atrium**

- Lipoma
- Lymphoma
- Metastasis
- Myxoma
- Sarcoma

**Right ventricle**

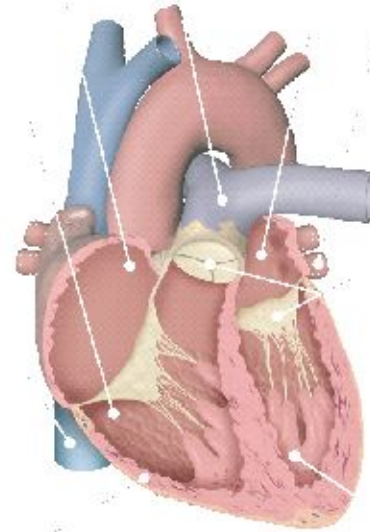
- Fibroma
- Lipoma
- Lymphoma
- Metastasis
- Rhabdomyoma

**Inferior cava vein**

- Leiomyoma
- Renal tumour

**Pericardium**

- Lipo sarcoma
- Lipoma
- Lymphoma
- Mesothelioma
- Metastasis


**Left atrium**

- Lipoma
- Metastasis
- Myxoma
- Sarcoma

**Pulmonary veins**

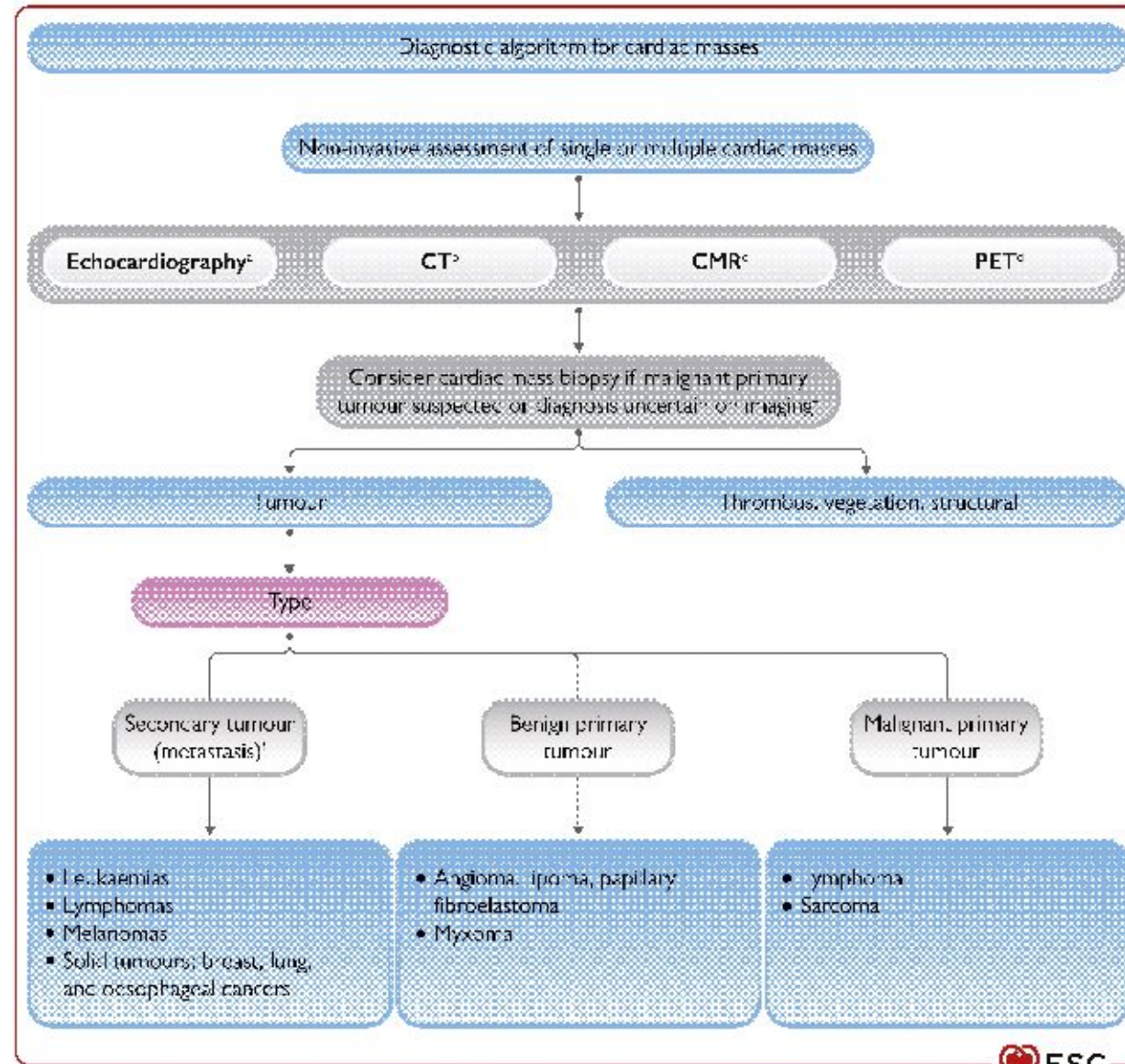
- Lung tumours
- Sarcoma

**Valves**

- Fibroelastoma
- Metastasis

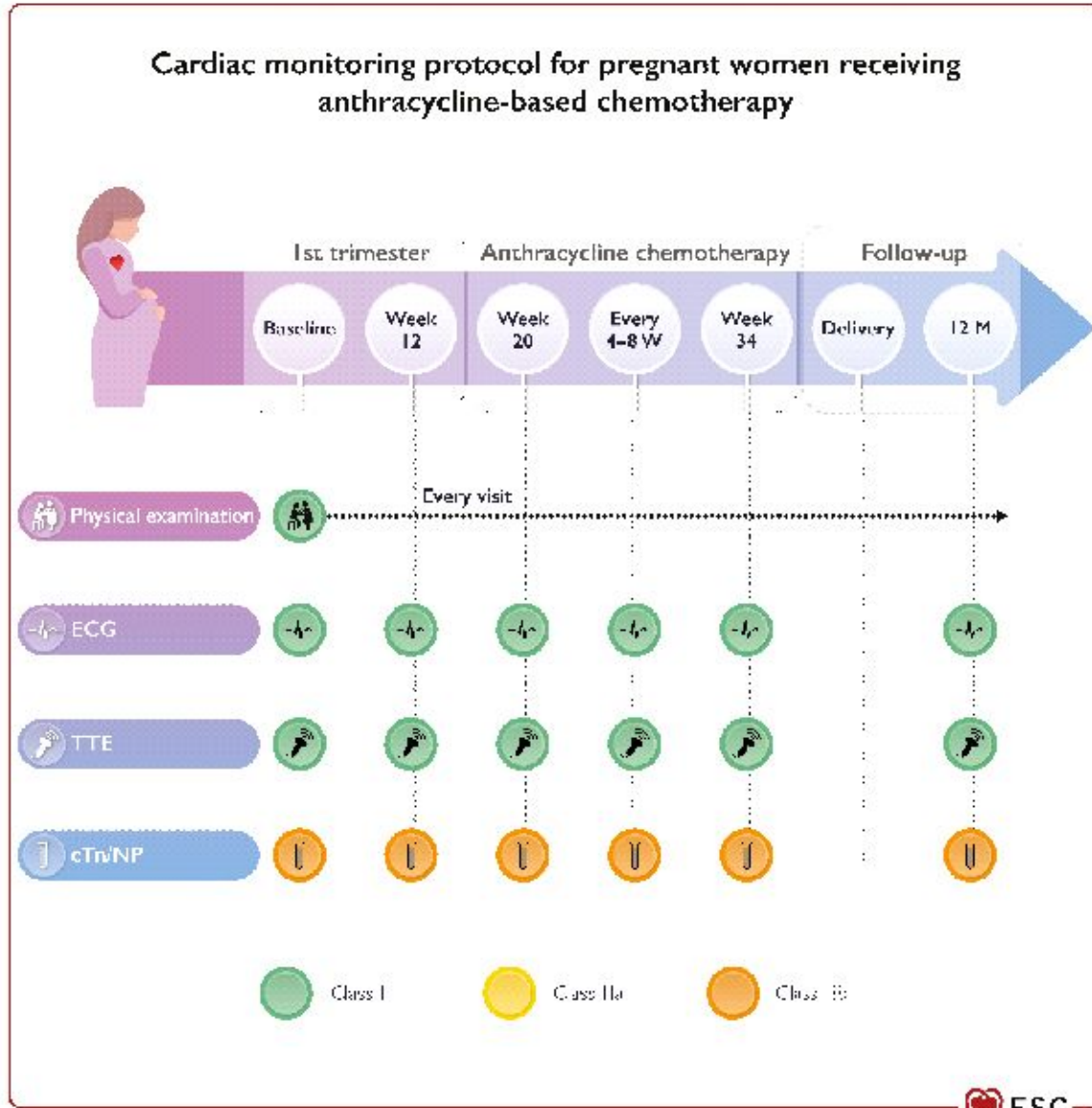
**Left ventricle**

- Fibroma
- Lipoma
- Lymphoma
- Metastasis
- Rhabdomyoma
- Sarcoma







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	Green	Light Blue
	Yellow	Light Blue
	Orange	Light Blue







## Carcinoid heart disease: clinical features and diagnostic tests

### Clinical features

Flushing

Pleural effusion

Broncho-constriction

Ascites

Diarrhoea

Peripheral oedema



### Diagnostic and prognostic tools

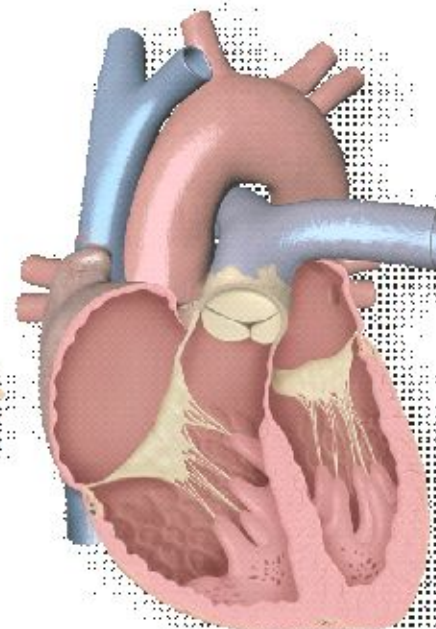
CMR

TTE

Circulating serotonin

NP

Urinary 5HIAA



## Non-invasive diagnosis of AL-CA

### Clinical features

#### Skin

- Bruising

#### CV

- AF/flutter
- Dyspnoea
- LHFpEF or unexplained right HF
- Hypotension or syncope
- Peripheral oedema

#### Nerves

- Orthostatic hypotension
- Peripheral polyneuropathy
- Polyneuropathy

#### Kidney

- Proteinuria
- Renal impairment

#### GI

- Constipation/diarrhoea
- Macroglossia
- Malabsorption/weight loss/nausea

### Investigations

Laboratory<sup>a</sup>

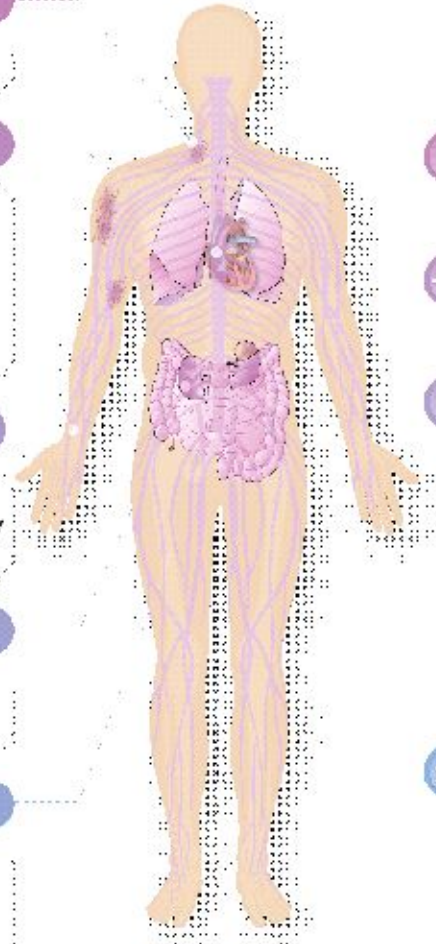
ECG<sup>b</sup>

TTE<sup>c</sup>

ECHO score  $\geq 8$ <sup>d</sup>

Characteristic echo findings<sup>e</sup>

CMR<sup>f</sup>



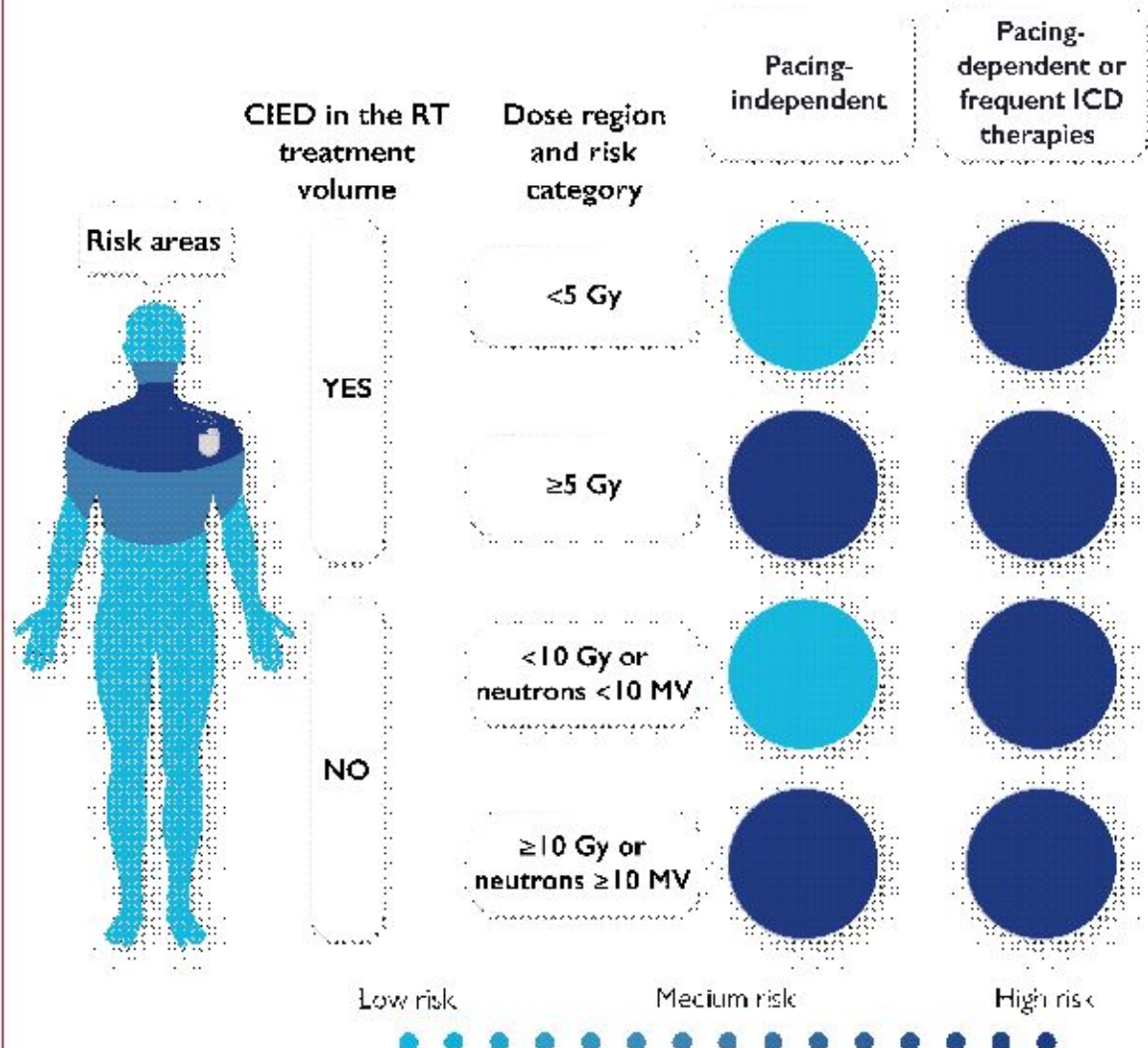


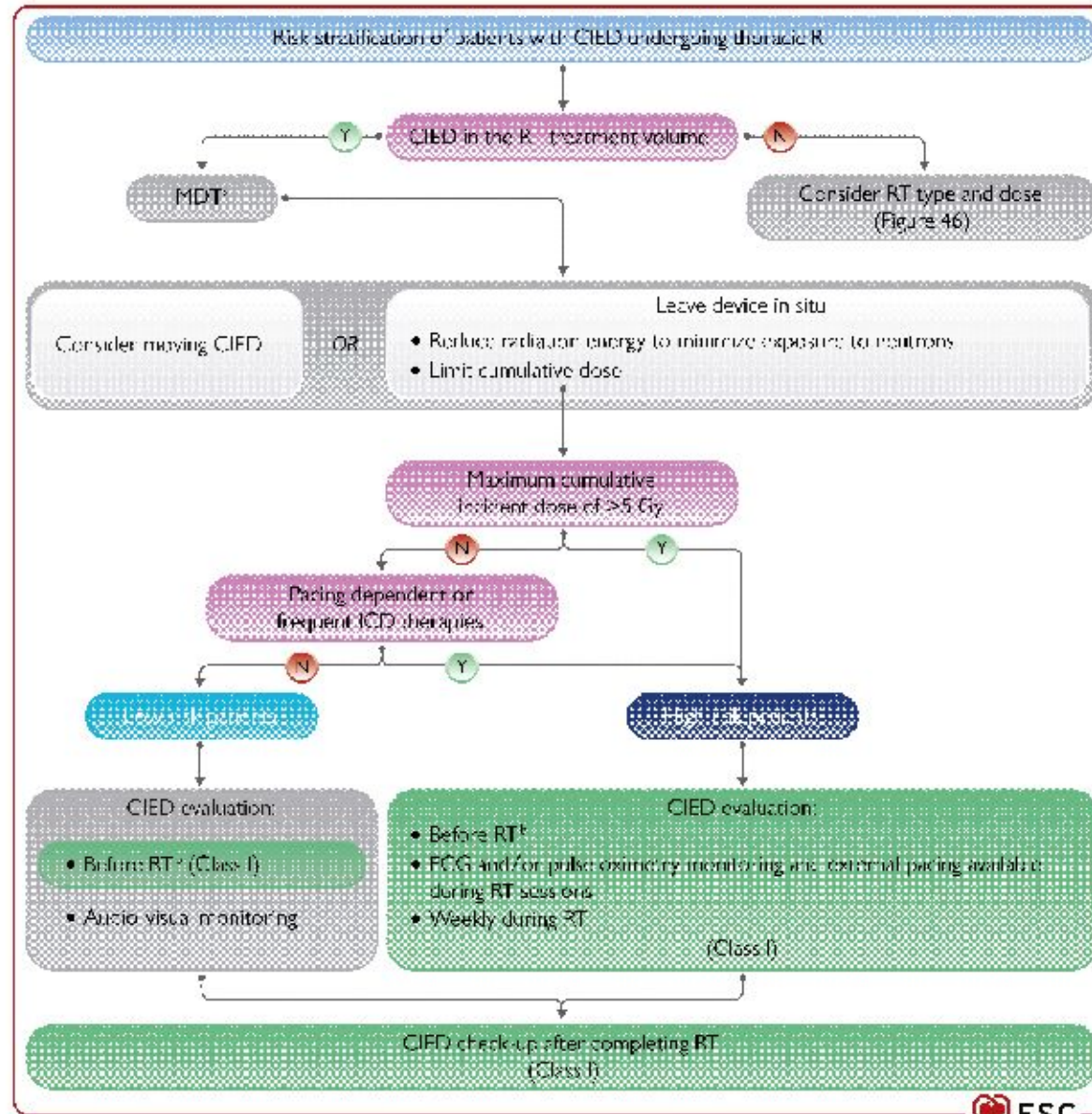


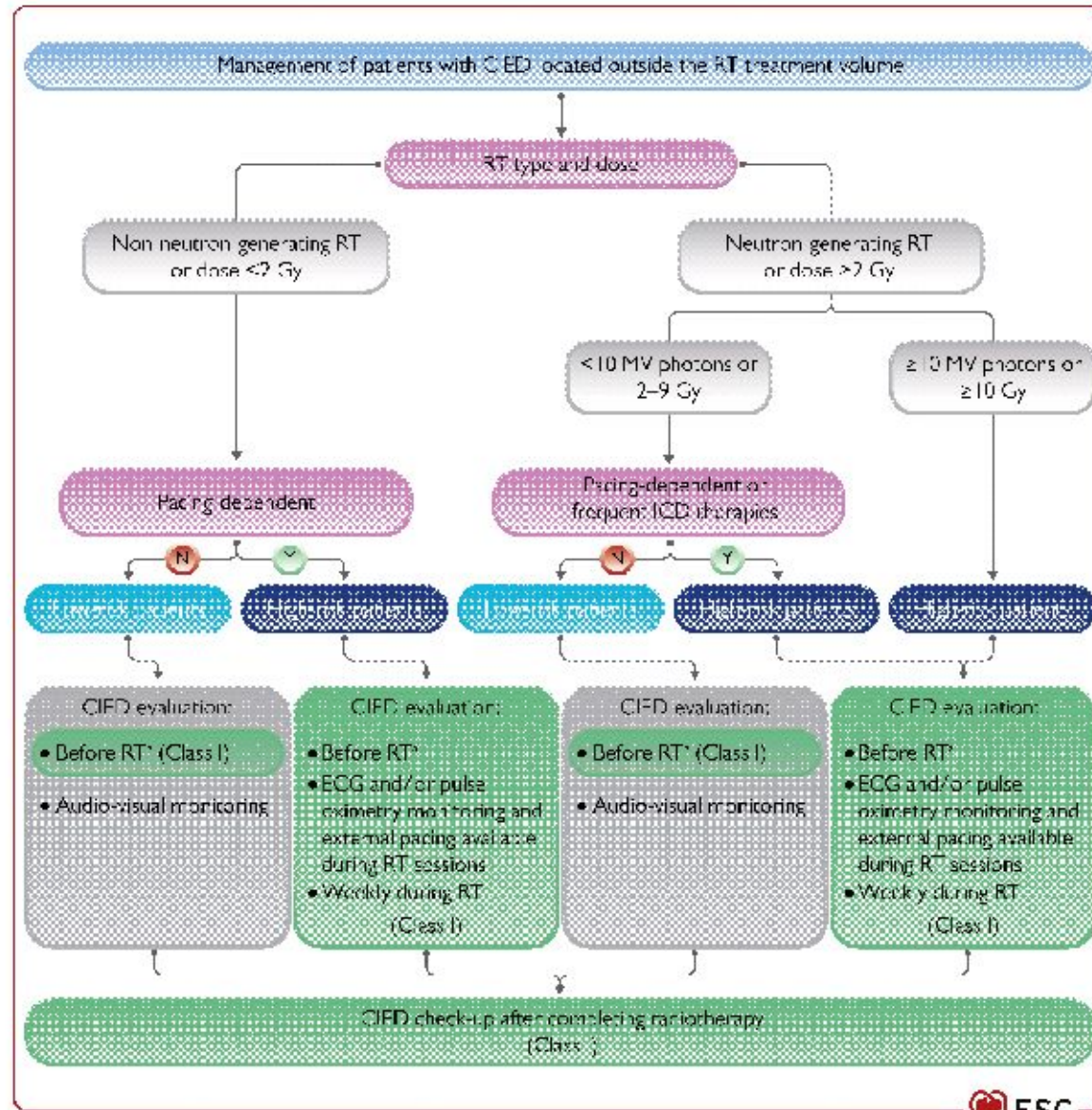


# Assessing risk of RT to CIED

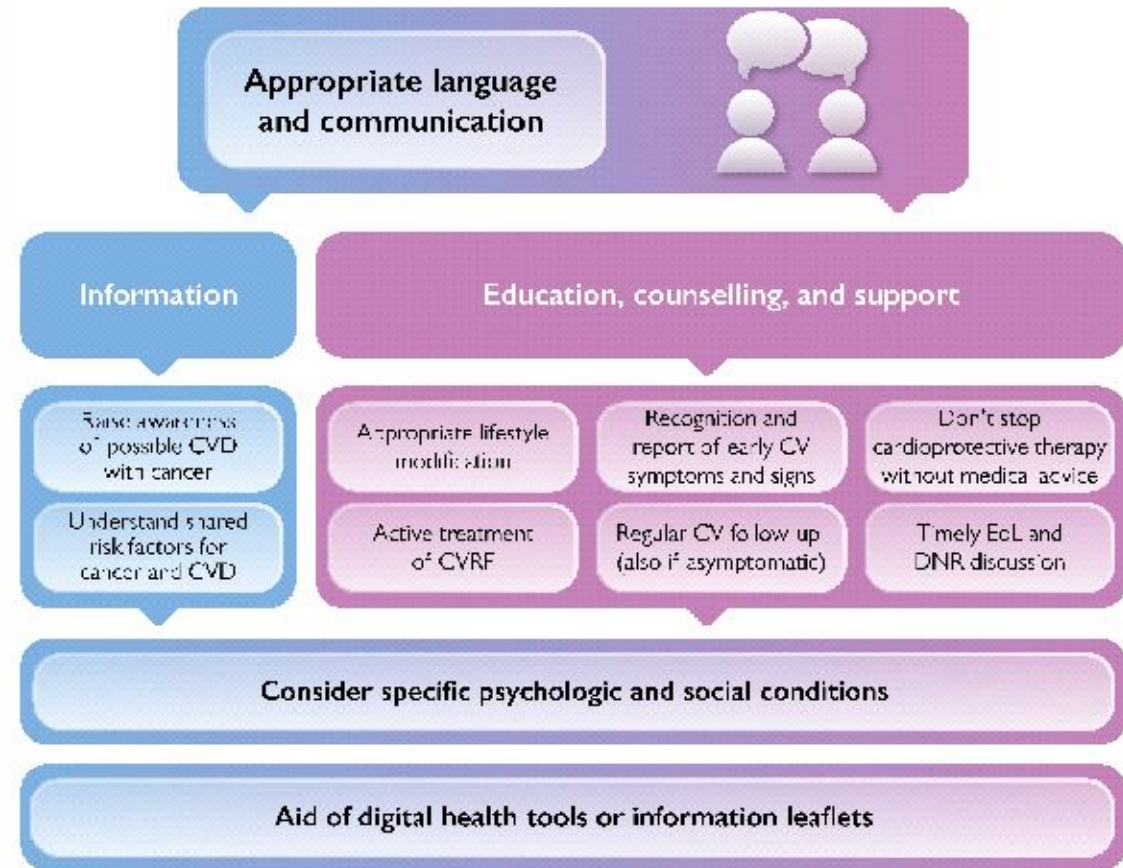
Patient



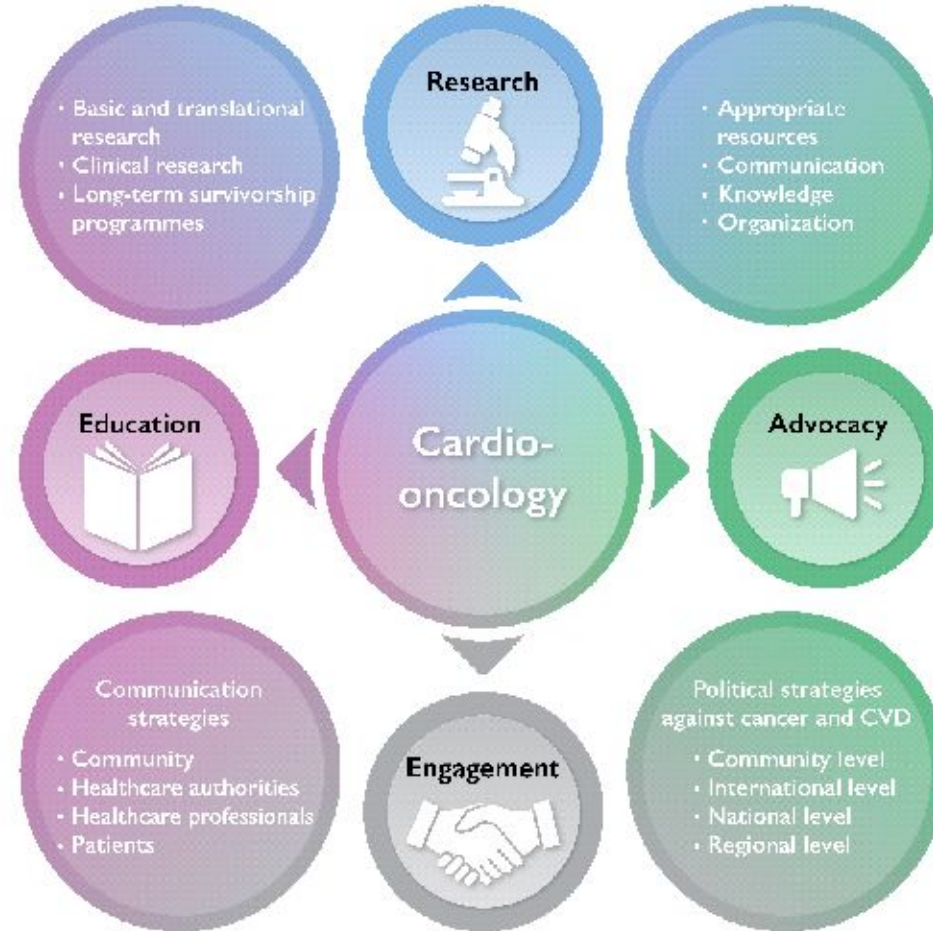


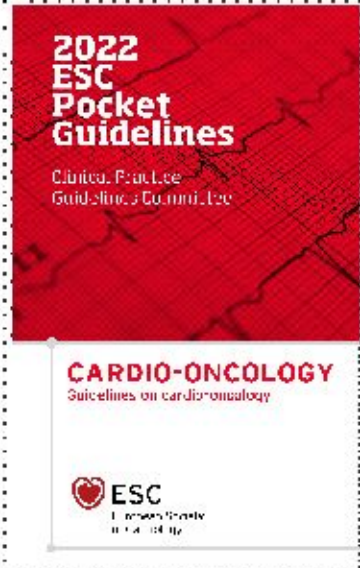


## Interaction between healthcare professionals and patients with cancer




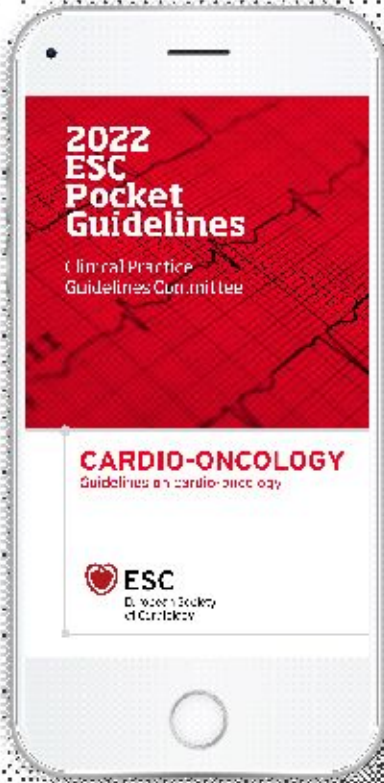
## The role of scientific societies in the promotion and development of cardio-oncology






**2022 ESC Pocket Guidelines**  
Clinical Practice Guidelines Committee

**CARDIO-ONCOLOGY**  
Guidelines on cardio-oncology

**2022 ESC Pocket Guidelines**  
Clinical Practice Guidelines Committee

**CARDIO-ONCOLOGY**  
Guidelines on cardio-oncology

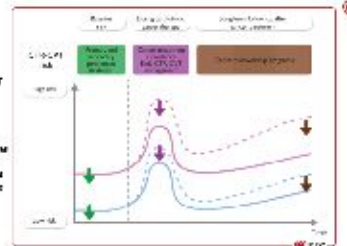


**2022 ESC Guidelines on cardio-oncology**  
Clinical Practice Guidelines Committee


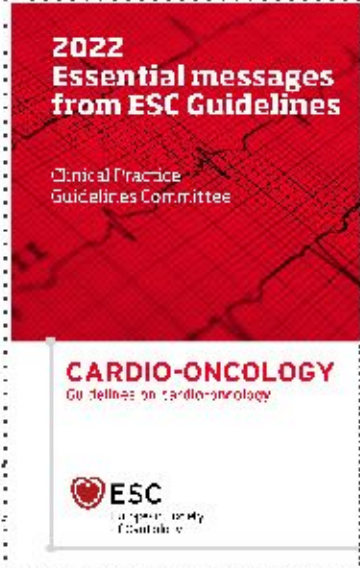
**Recommendations for a generic approach to cardiovascular toxicity risk ESC categorization (1)**

Recommendation	Class	Level
Oral bisphosphonates or clodronate should be used as first-line therapy in metastatic breast cancer patients with bone metastases.	I	A
Oral bisphosphonates should be used as first-line therapy in metastatic breast cancer patients with bone metastases.	I	C
Oral bisphosphonates should be used as first-line therapy in metastatic breast cancer patients with bone metastases.	IIa	B
Oral bisphosphonates should be used as first-line therapy in metastatic breast cancer patients with bone metastases.	IIb	B

**Figure 1**  
Dynamics of cardiovascular toxicity risk of patients with cancer over their therapy continuum



Available as mobile app on the European Heart Journal website and the ESC Pocket Guidelines App

**2022 Essential messages from ESC Guidelines**  
Clinical Practice Guidelines Committee

**CARDIO-ONCOLOGY**  
Guidelines on cardio-oncology

