Sport en cardiomyopathie

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TeamNL

HIGH PERFORMANCE PARTNER

SPORTS LIFESTYLE & HEALTH

Organisation recognised by the

INTERNATIONAL OLYMPIC COMMITTEE

Disclosure belangen spreker

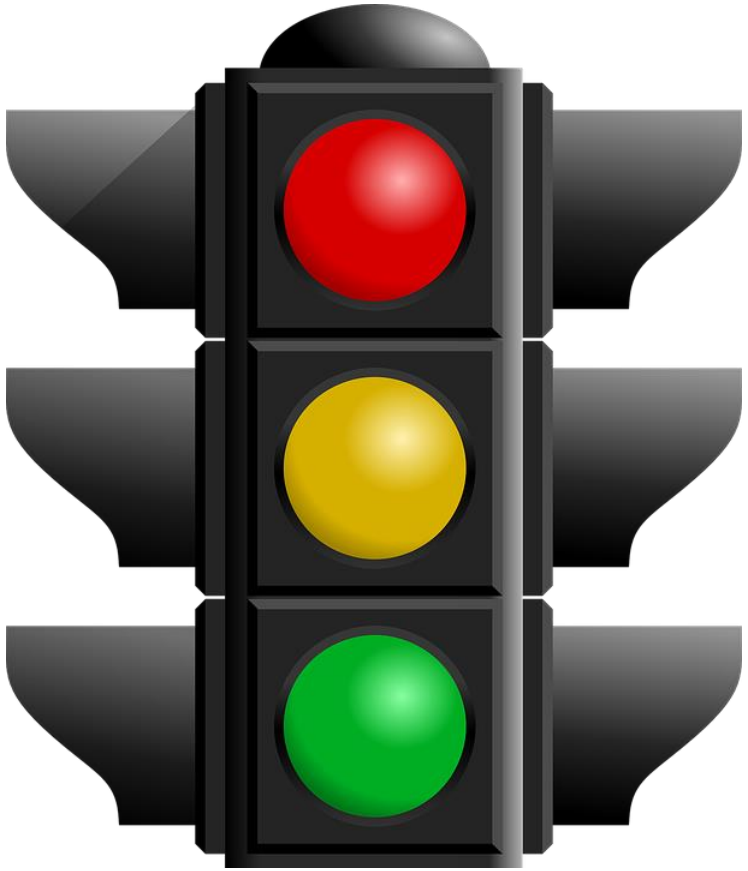
HT Jorstad

(potentiële) belangenverstrengeling	Zie hieronder
Voor bijeenkomst mogelijk relevante relaties met bedrijven	Bedrijfsnamen
• Onderzoeksgelden • Advisory/ speaker fees	• NOC*NSF • Hartstichting • ZonMw • Amgen, Sanofi

Yakult

Scotiabank
ED

Yakult



Scotiabank
ED

Poll

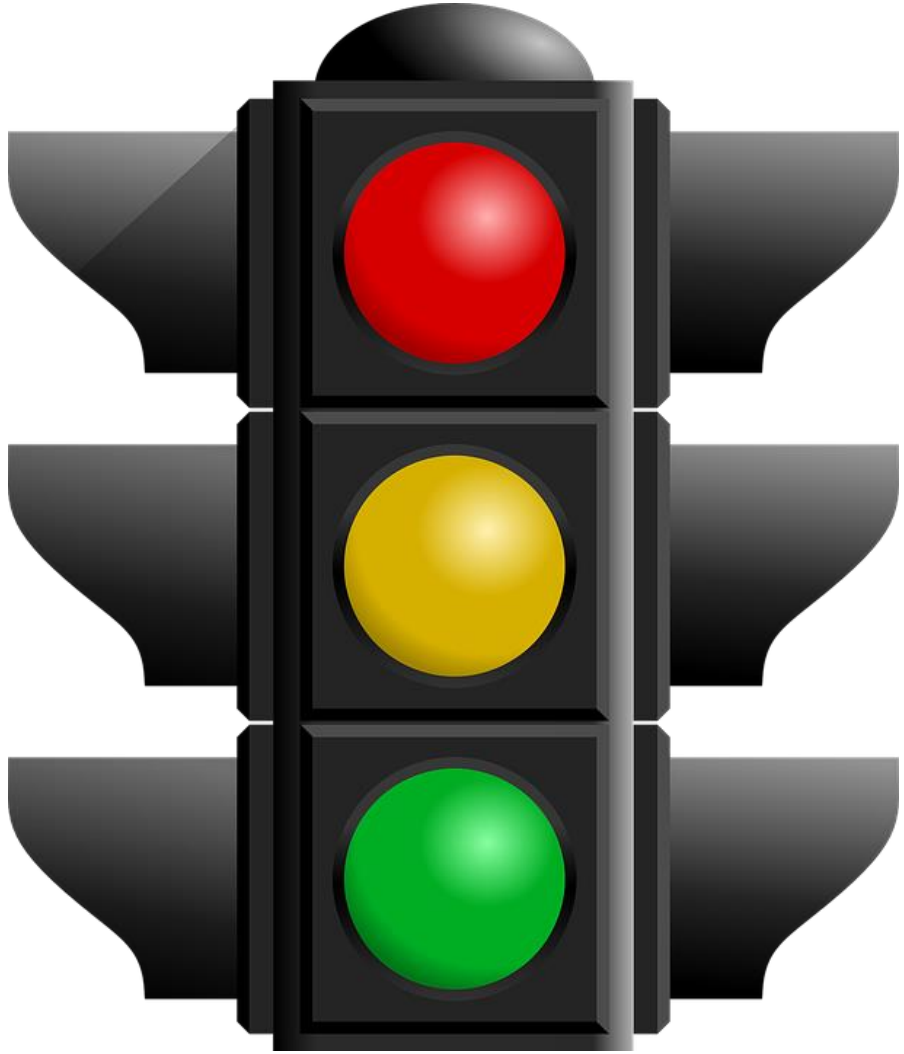
Aan mijn patiënten met een CMP geef ik

A. Het NL beweegadvies
B. Een maximale hartslag advies
C. Sportadvies: volume en intensiteit
D. Gingen ze maar sporten
E. Anders

Overzicht

- Aritmogene cardiomyopathie (ARVC/ ACM)
- Non-compaction (left ventricular) cardiomyopathie (LVNC)
- Dilaterende cardiomyopathie (DCM)
- Hypertrofische cardiomyopathie (HCM)

- Casus: de oude sporter
- Specifieke sportadviezen (do’s and don’t’s)
- Take home



Richtlijnen/ consensus documents

AHA/ACC Scientific Statement

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 1: Classification of Sports: Dynamic, Static, and Impact

A Scientific Statement From the American Heart Association and American College of Cardiology

Benjamin D. Levine, MD, FAHA, FACC, Chair; Aaron L. Baggish, MD, FACC; Richard J. Kovacs, MD, FAHA, FACC; Mark S. Link, MD, FACC; Martin S. Maron, MD, FACC; Jere H. Mitchell, MD, FACC; on behalf of the American Heart Association Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, and the American College of Cardiology

AHA/ACC Scientific Statement

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 3: Hypertrophic Cardiomyopathy, Arrhythmogenic Right Ventricular Cardiomyopathy and Other Cardiomyopathies, and Myocarditis

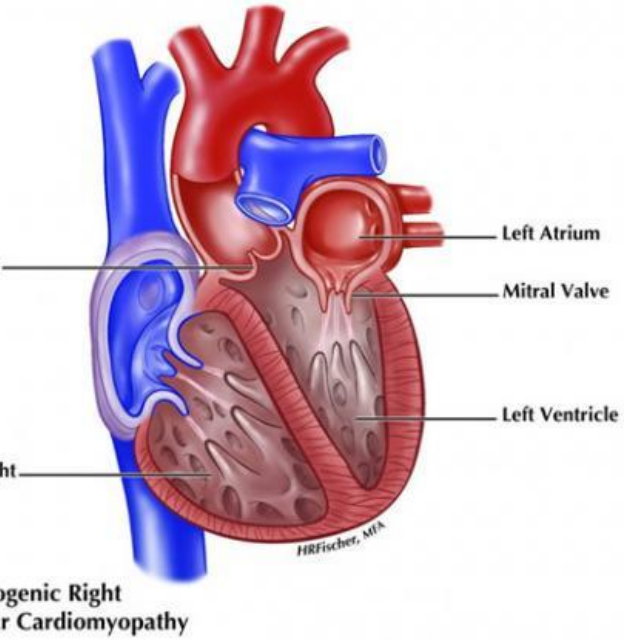
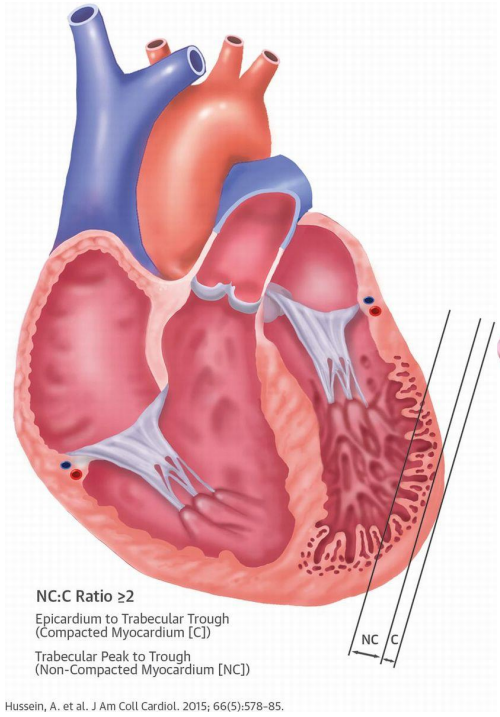
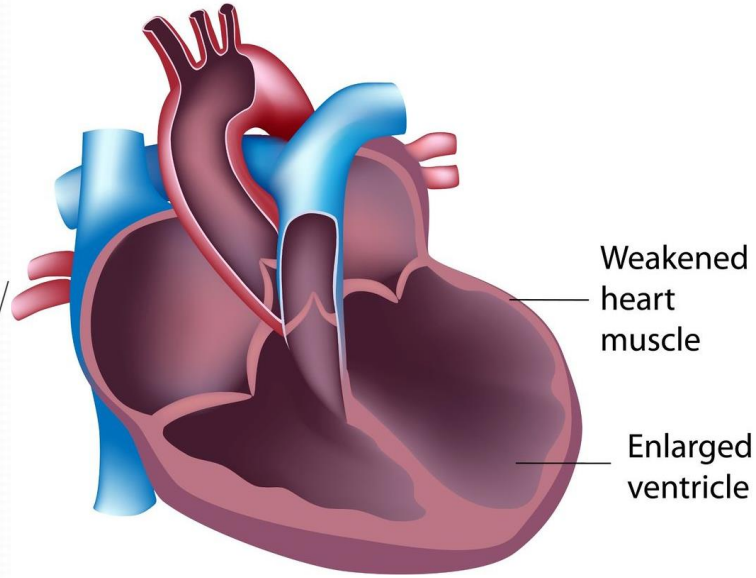
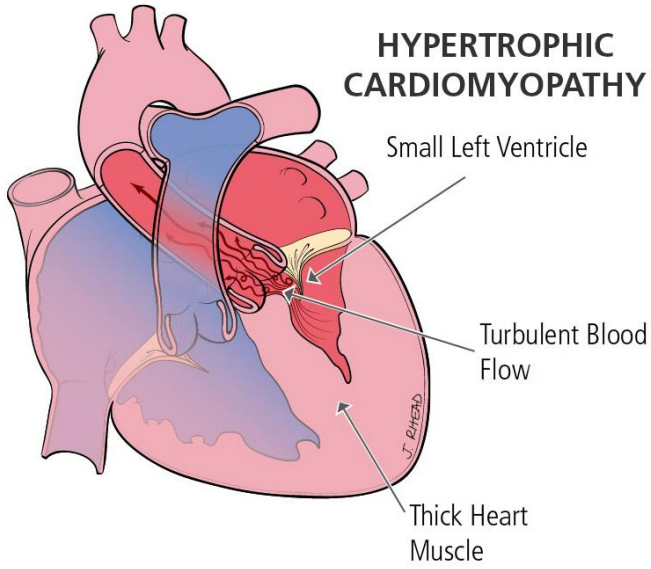
A Scientific Statement From the American Heart Association and American College of Cardiology

Barry J. Maron, MD, FACC, Chair; James E. Udelson, MD, FAHA, FACC; Robert O. Bonow, MD, MS, FAHA, MACC; Rick A. Nishimura, MD, FAHA, MACC; Michael J. Ackerman, MD, PhD; N.A. Mark Estes III, MD, FACC; Leslie T. Cooper, Jr, MD, FAHA, FACC; Mark S. Link, MD, FACC; Martin S. Maron, MD, FACC; on behalf of the American Heart Association Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, and the American College of Cardiology

2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease

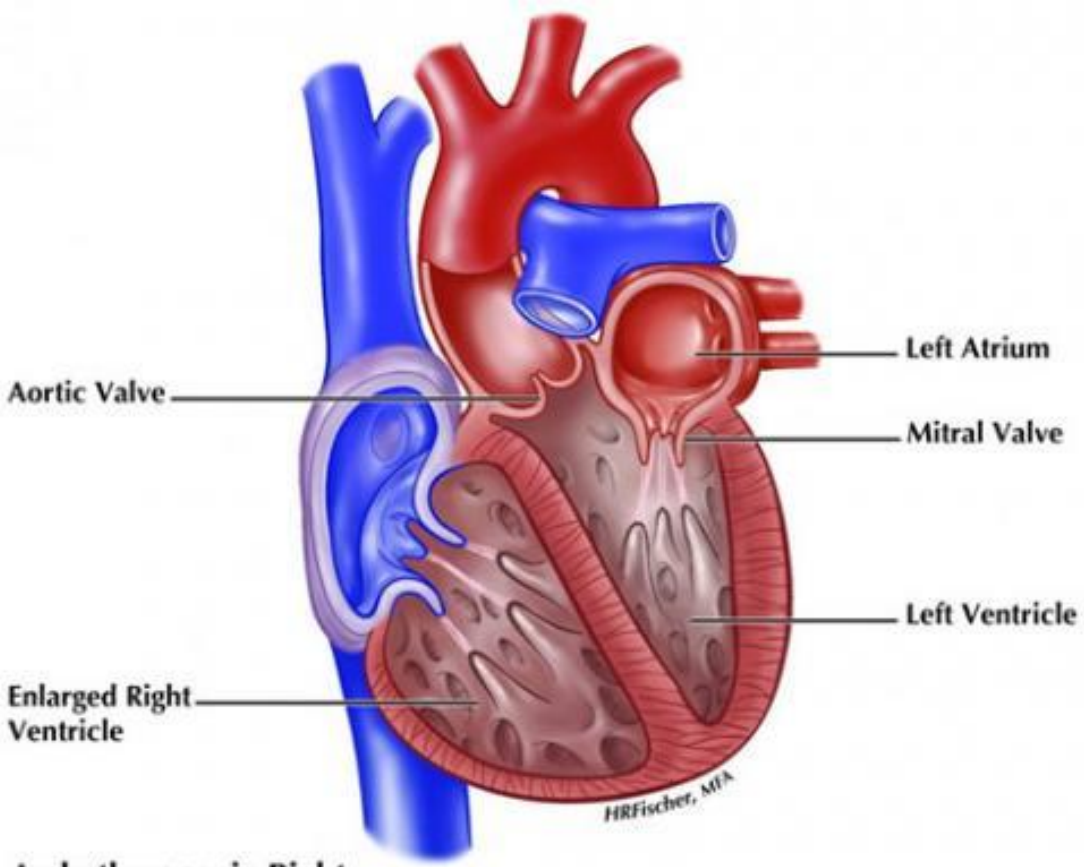
ESC
European Society of Cardiology

Incidentie

ACM/ ARVC	LVNC	DCM	HCM
			
1: 2000- 5000	1: ?	1: 250 - 500	1: 250 - 500

McKenna et al, 2017

ACM/ ARVC


Aortic Valve
Left Atrium
Mitral Valve
Left Ventricle
Enlarged Right Ventricle
HRFischer, MFA
Arrhythmogenic Right Ventricular Cardiomyopathy

ACM/ ARVC

- Mechanische ontkoppeling myocyten
- Trigger maligne ventriculaire aritmieen
- Sport belangrijke omgevingsfactor ontwikkelen en progressie ziekte
- Zowel in experimentele (muis)studies als in observationele studies

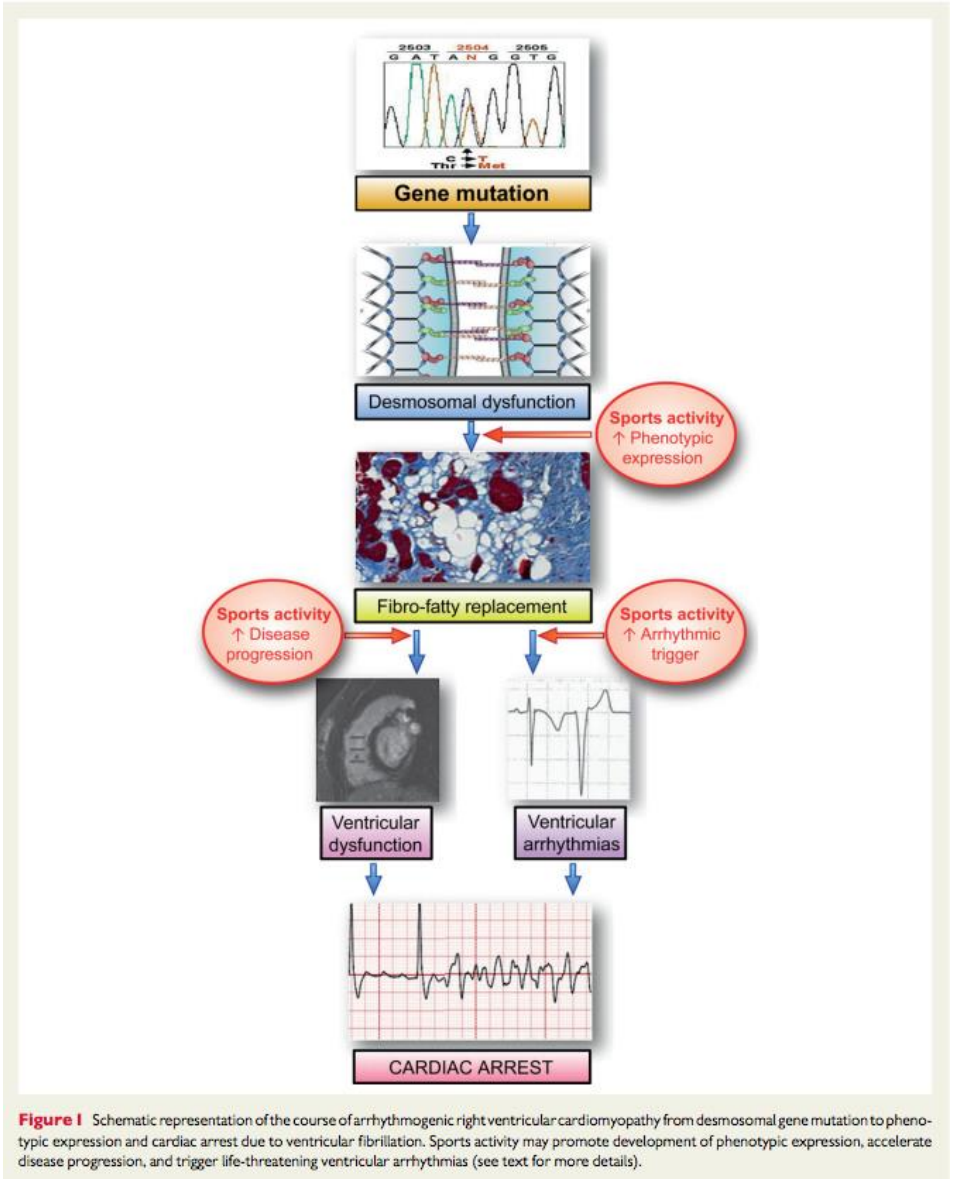
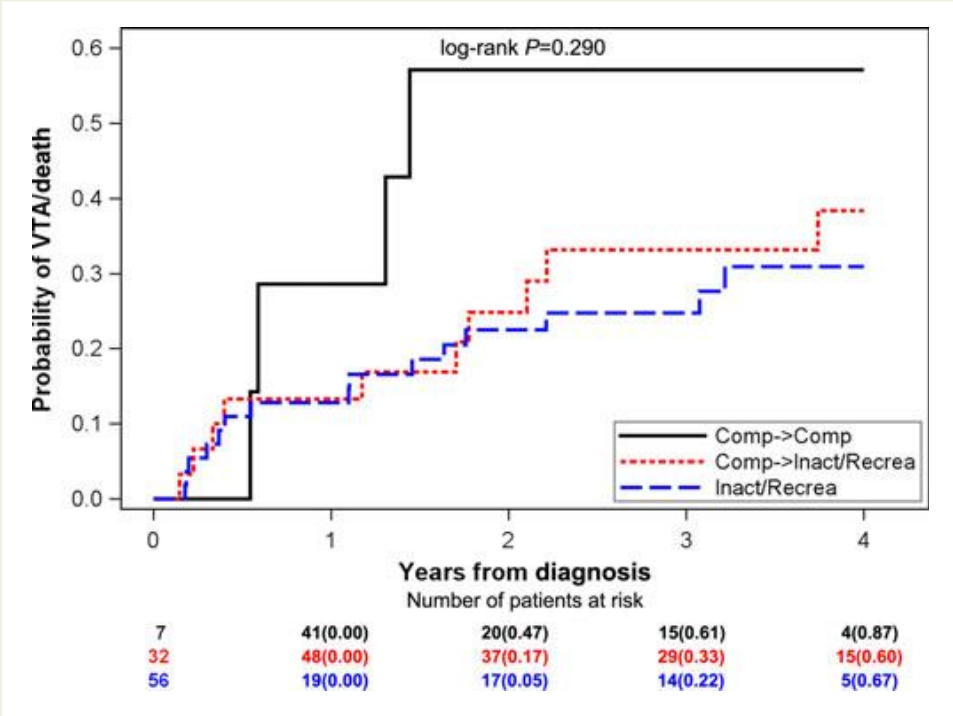


Figure 1 Schematic representation of the course of arrhythmogenic right ventricular cardiomyopathy from desmosomal gene mutation to phenotypic expression and cardiac arrest due to ventricular fibrillation. Sports activity may promote development of phenotypic expression, accelerate disease progression, and trigger life-threatening ventricular arrhythmias (see text for more details).

Corrado, Zorzi, 2015

Sporten met ARVC

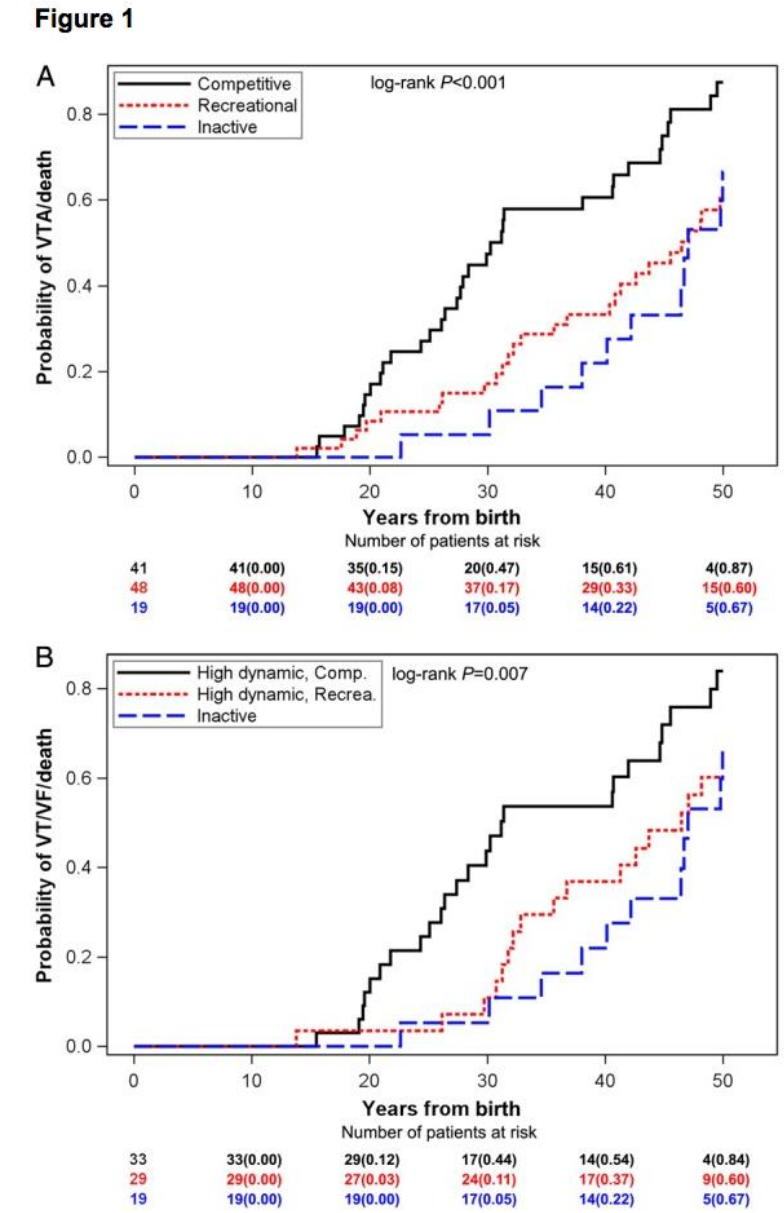
- N=108 ARVC probands
- VTA/ mortaliteit 42% wanneer doorgegaan met competitieve sport na diagnose ARVC
- Recreatief en inactief vergelijkbaar



Ruwald et al, EHJ 2015

Sporten met ARVC

- Sporters jonger gediagnosticeerd met ARVC (30 vs 38 jaar)
- Competitieve sport 2x kans op VTA/ mortaliteit
- Met name verhoogd risico hoog-dynamisch competitief



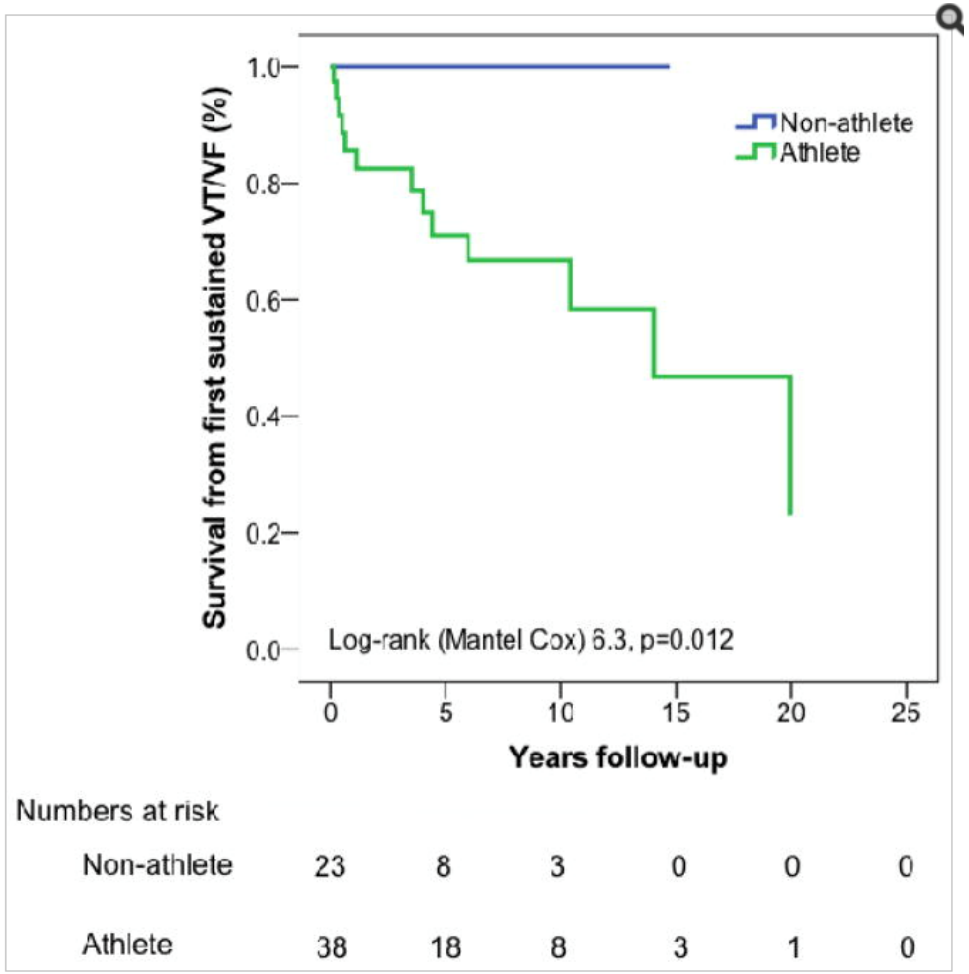
Ruwald et al, EHJ 2015

Gendragers

Exercise Increases Age-Related Penetrance and Arrhythmic Risk in Arrhythmogenic Right Ventricular Dysplasia/Cardiomyopathy Associated Desmosomal Mutation Carriers

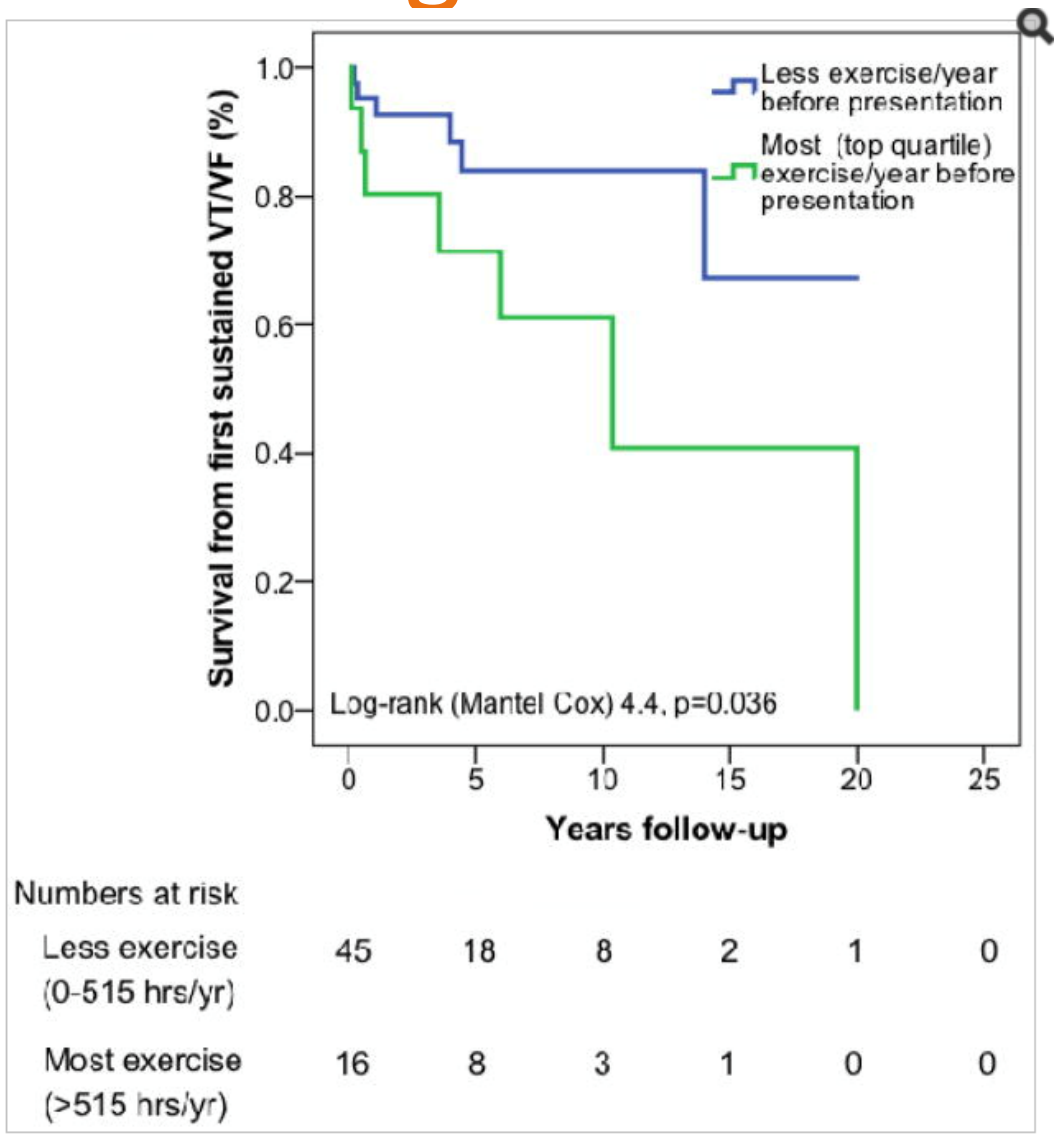
Cynthia A. James, ScM, PhD, Aditya Bhonsale, MD, Crystal Tichnell, MGC, Brittney Murray, MS, Stuart D. Russell, MD, Harikrishna Tandri, MD, Ryan J. Tedford, MD, Daniel P. Judge, MD, and Hugh Calkins, MD

- 87 gendragers ARVC
- Johns Hopkins ARVD/C Registry
- Exercise interviews
- Leeftijd interview 11-88 jaar (mean 44)
- 76 PKP2
- Uitkomsten: VT/VF, hartfalen, diagnose ARVC

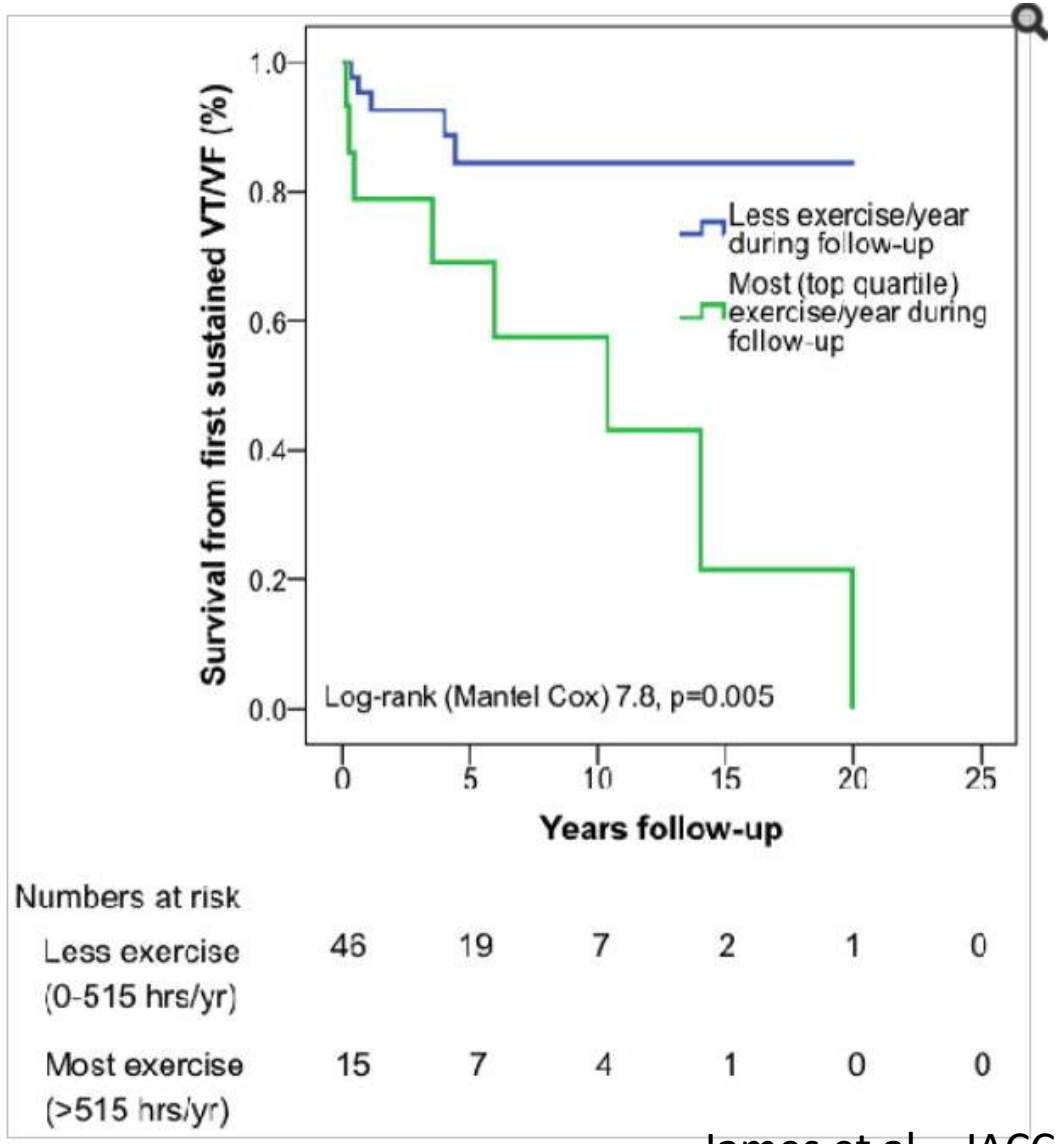


James et al., JACC 2013

Overleving na 1e VTA



Numbers at risk						
Less exercise (0-515 hrs/yr)	45	18	8	2	1	0
Most exercise (>515 hrs/yr)	16	8	3	1	0	0

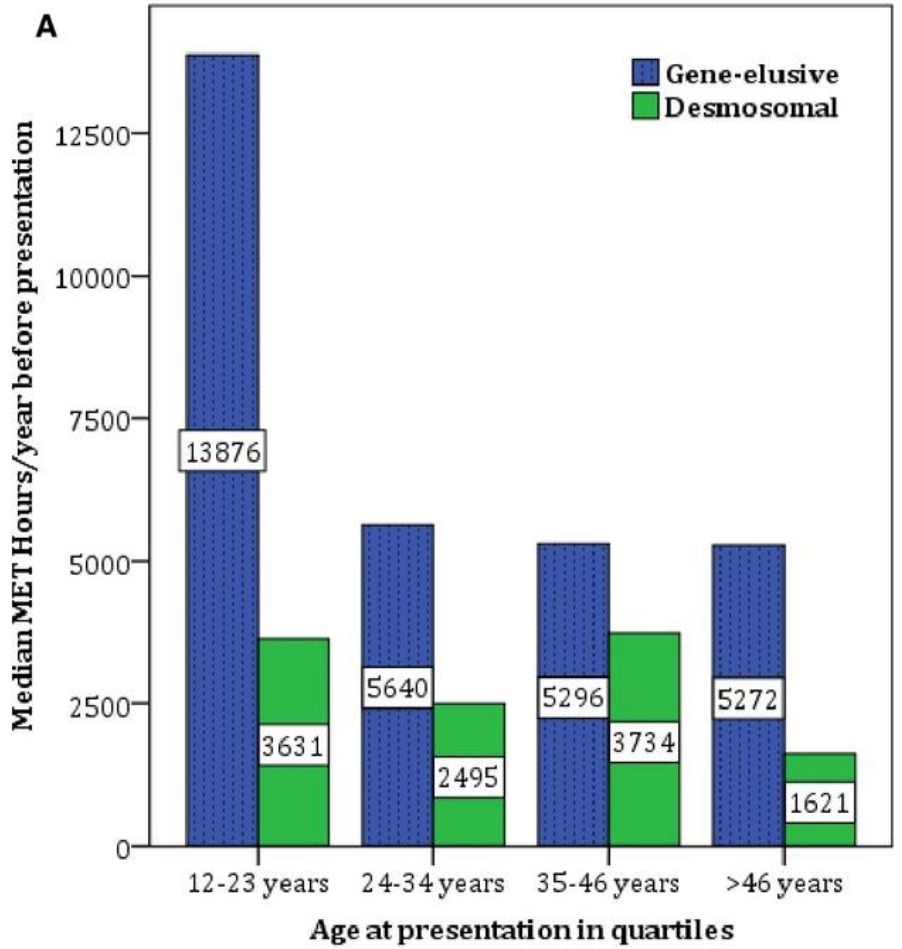


Numbers at risk						
Less exercise (0-515 hrs/yr)	46	19	7	2	1	0
Most exercise (>515 hrs/yr)	15	7	4	1	0	0

James et al., JACC 2013

Sporten en ontwikkelen ARVC

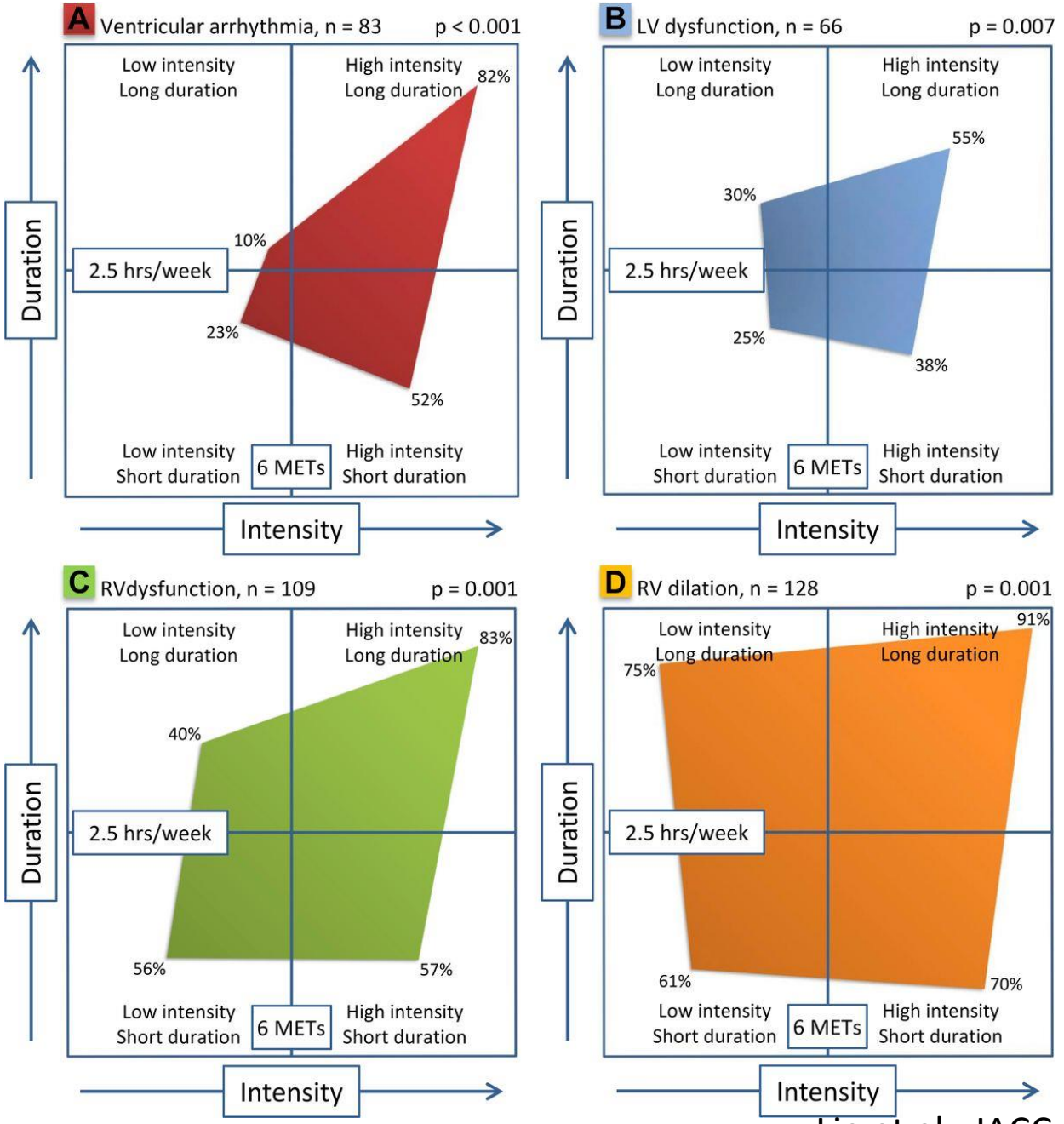
- ARVC n=82
- Duursport sterk geassocieerd met ontwikkelen ARVC in gen-elusive individueen
- Alle gen-elusive ARVCs waren sporters



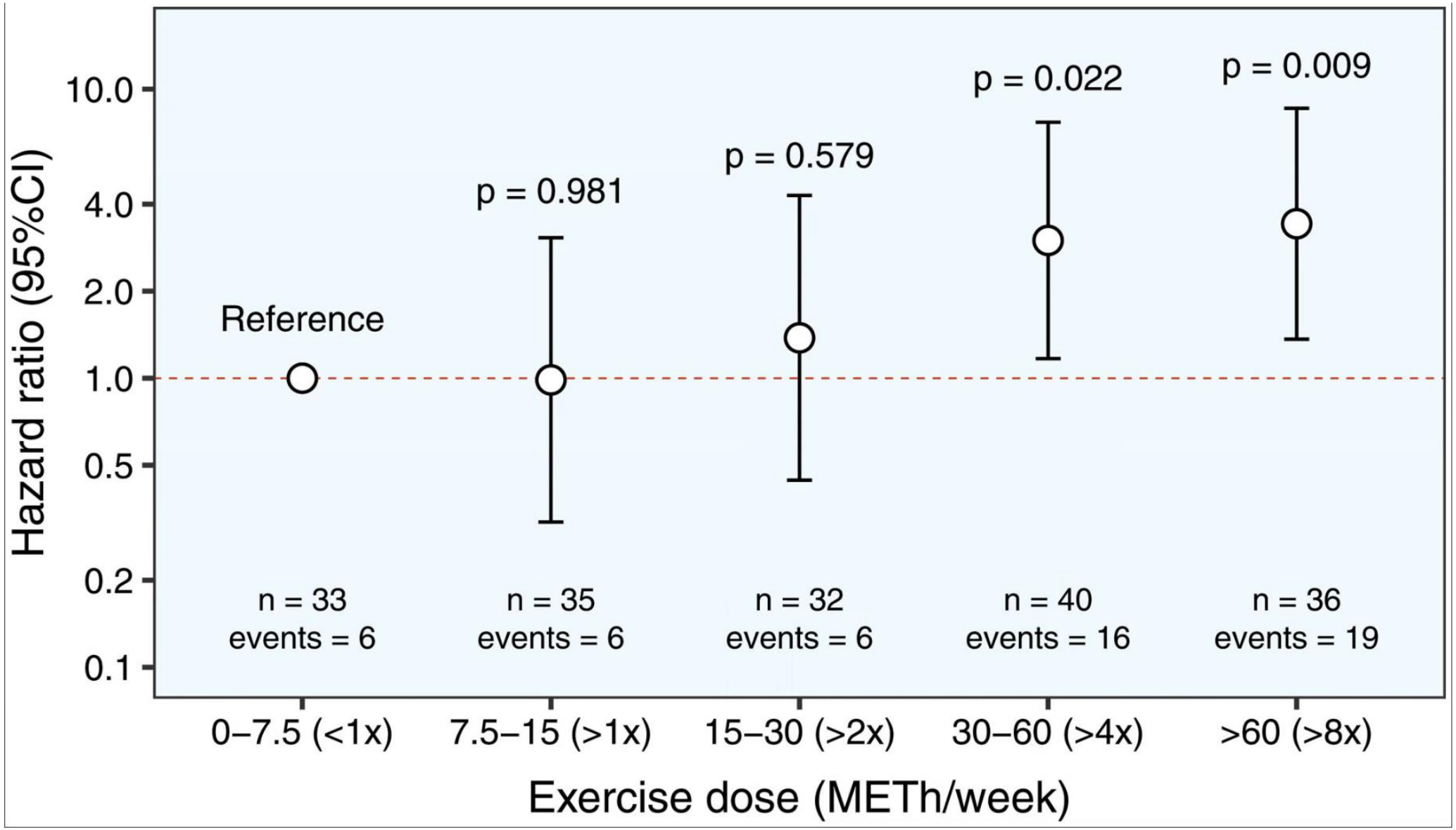
Sawant et al, JAHA 2014

Wat wel?

- 1 studie (!)
- 173 ARVC patiënten
- 53% proband, 44% ♀
- **Duur + intensiteit** slechtste uitkomsten
- **< 6 METs <2.5u** beste uitkomsten
- Niet-intensieve duursport?

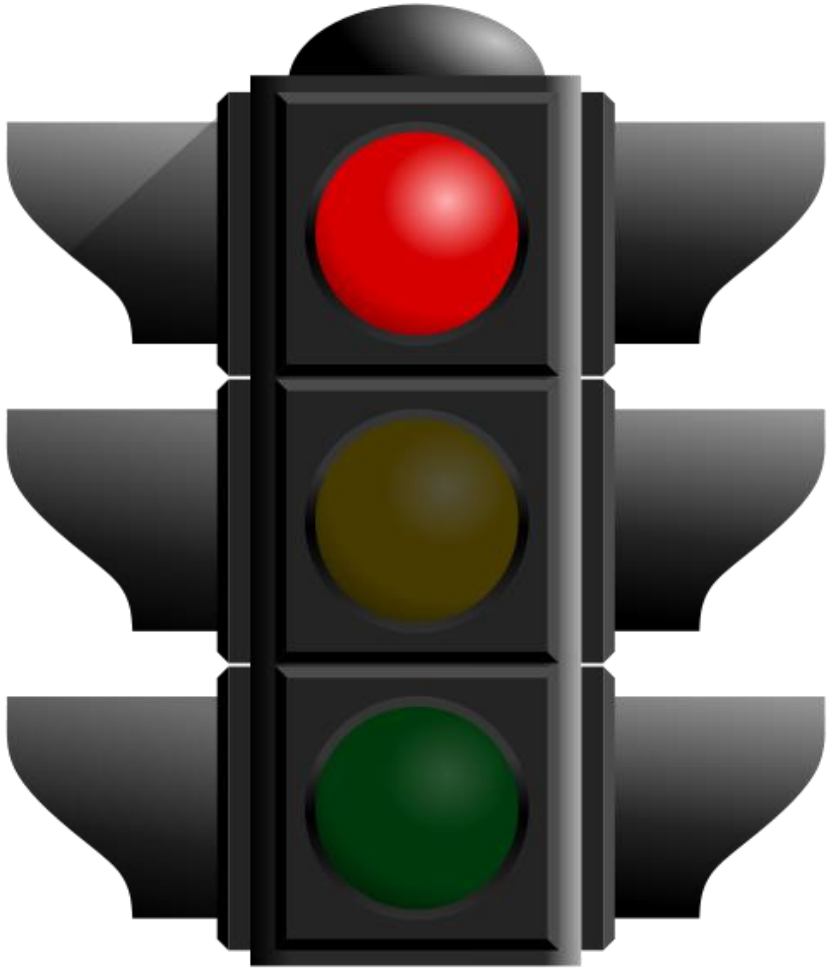


Lie et al, JACC: CE 2018



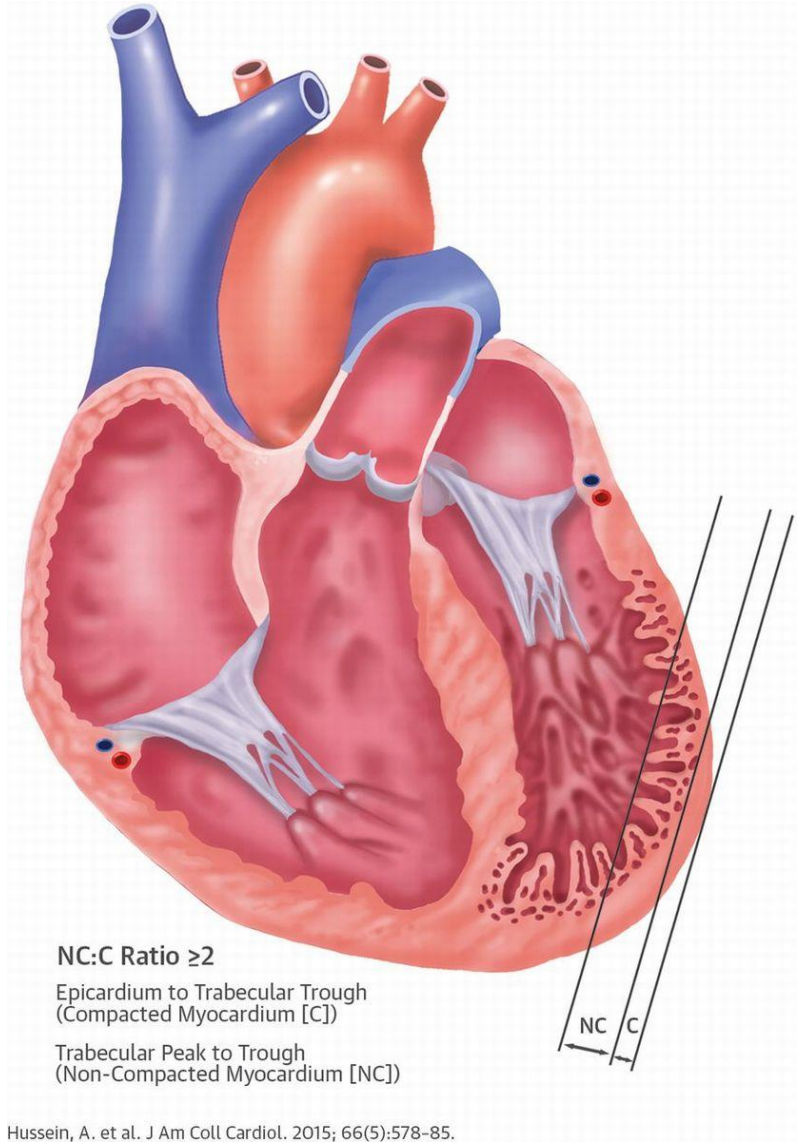
Bosman et al. Circulation: Arrhythmia and Electrophysiology. 2022

Sporten en ARVC



- Patiënten
- Gendragers (PKP2)

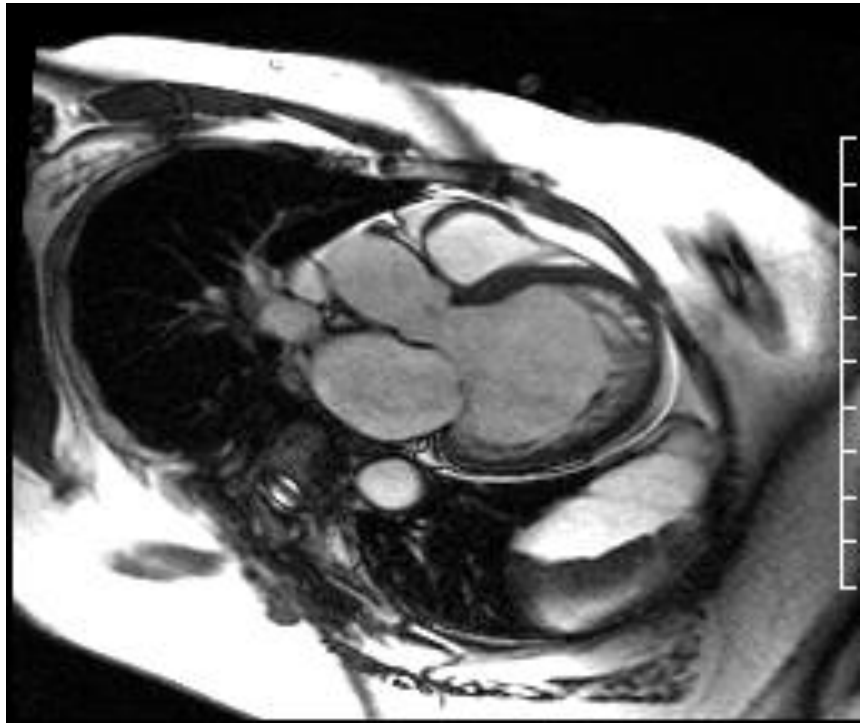
Sport en LVNC



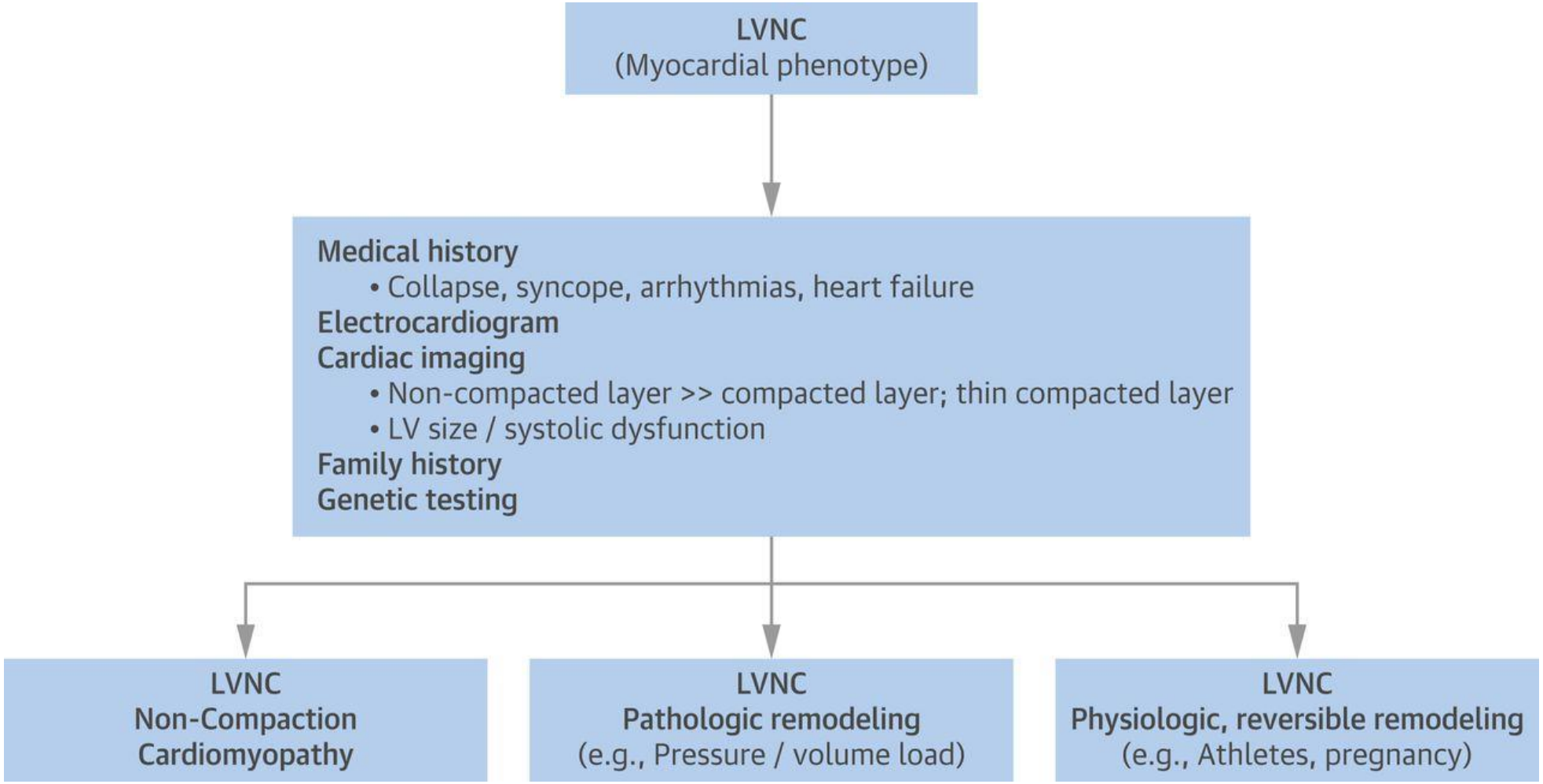
Hussein, A. et al. J Am Coll Cardiol. 2015; 66(5):578-85.

LVNC

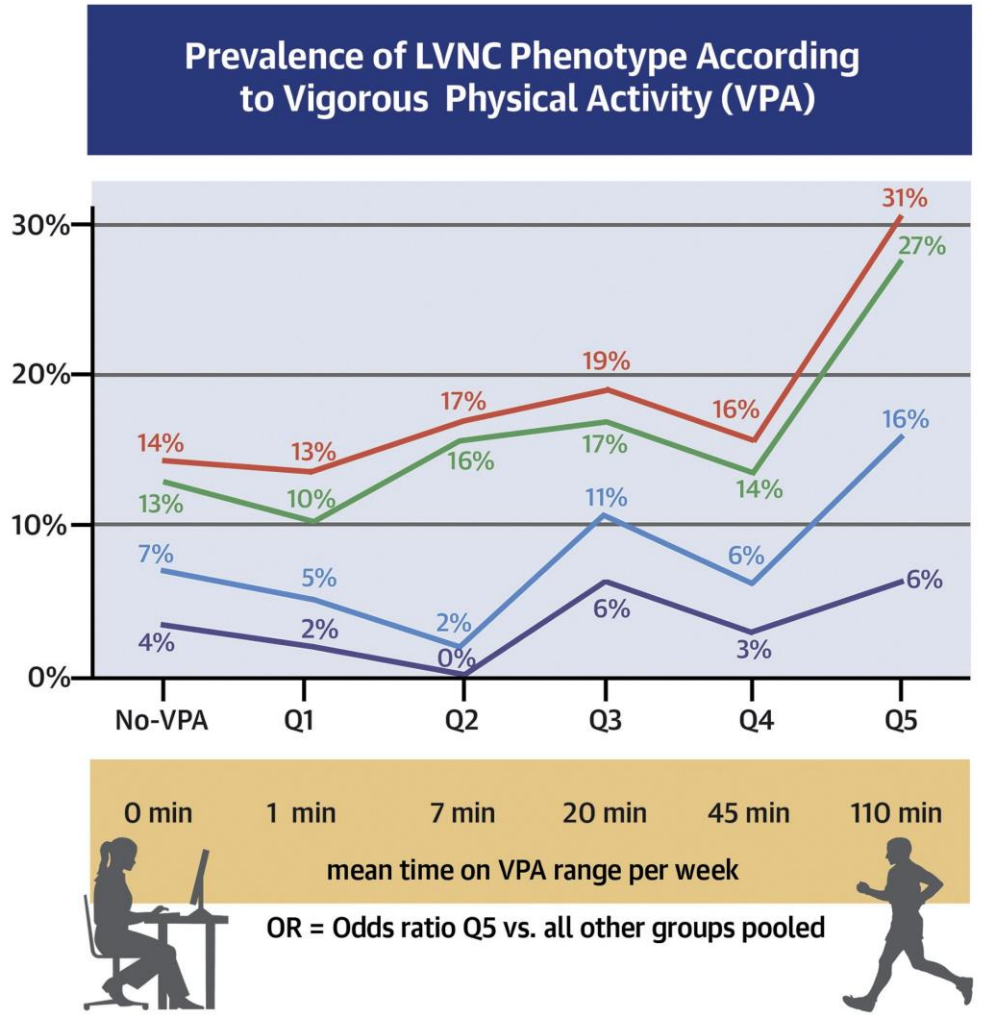
- Hypertrabecularisatie lastig te interpreteren in sporters
- 8% sporters voldoen aan morfologische criteria LNNC
- 0.9% sporters met hypertrabecularisatie hebben verdere ondersteunende afwijkingen



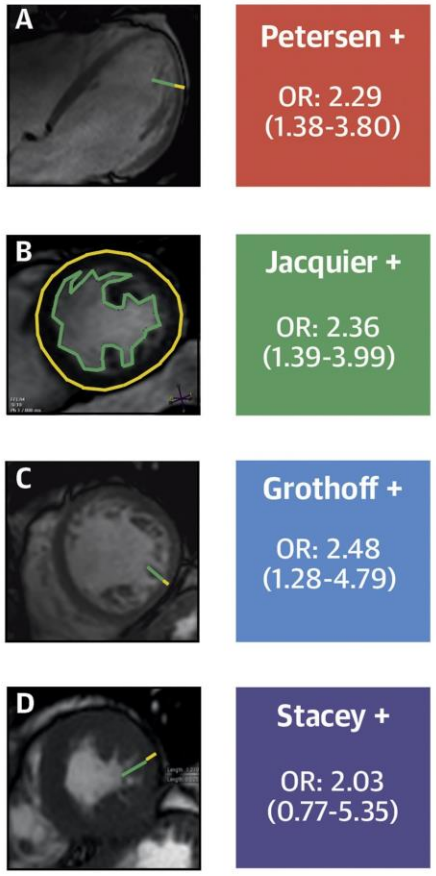
Onderscheid uitdagend



Oechlin and Jenni, 2018



de la Chica, J.A. et al. J Am Coll Cardiol. 2020;76(15):1723-33.



Aanvullende argumenten:

- Symptomen
- Familie+ / genetica
- Myocarddysfunctie
- ECG-afwijkingen

Hoe meer afwijkingen => meer sport restricties

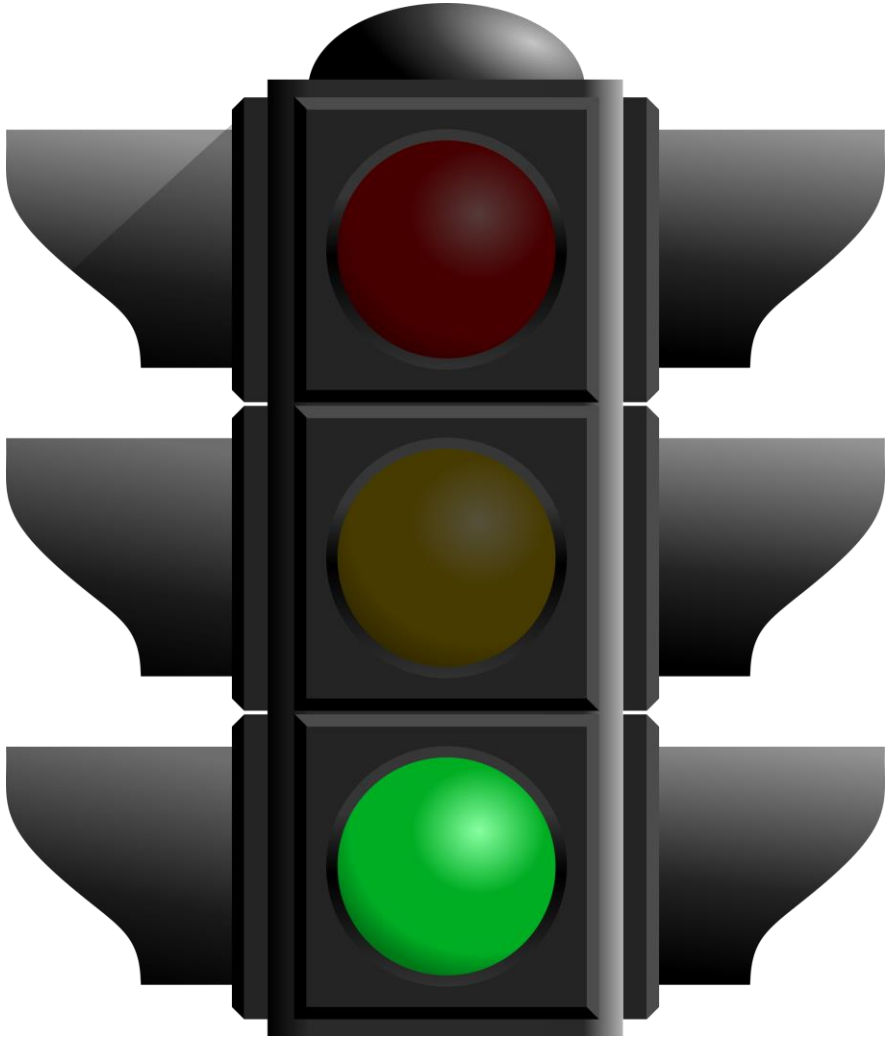
Wanneer wel/ niet sporten

- Wanneer stoppen
  - Symptomatisch
  - Syncope
  - Frequente en/of complexe ventriculaire aritmieen, nsVTs
  - Duidelijk verminderde LVEF
- Risicosporten

Table 5 **Recommendations for athletes with LVNC**

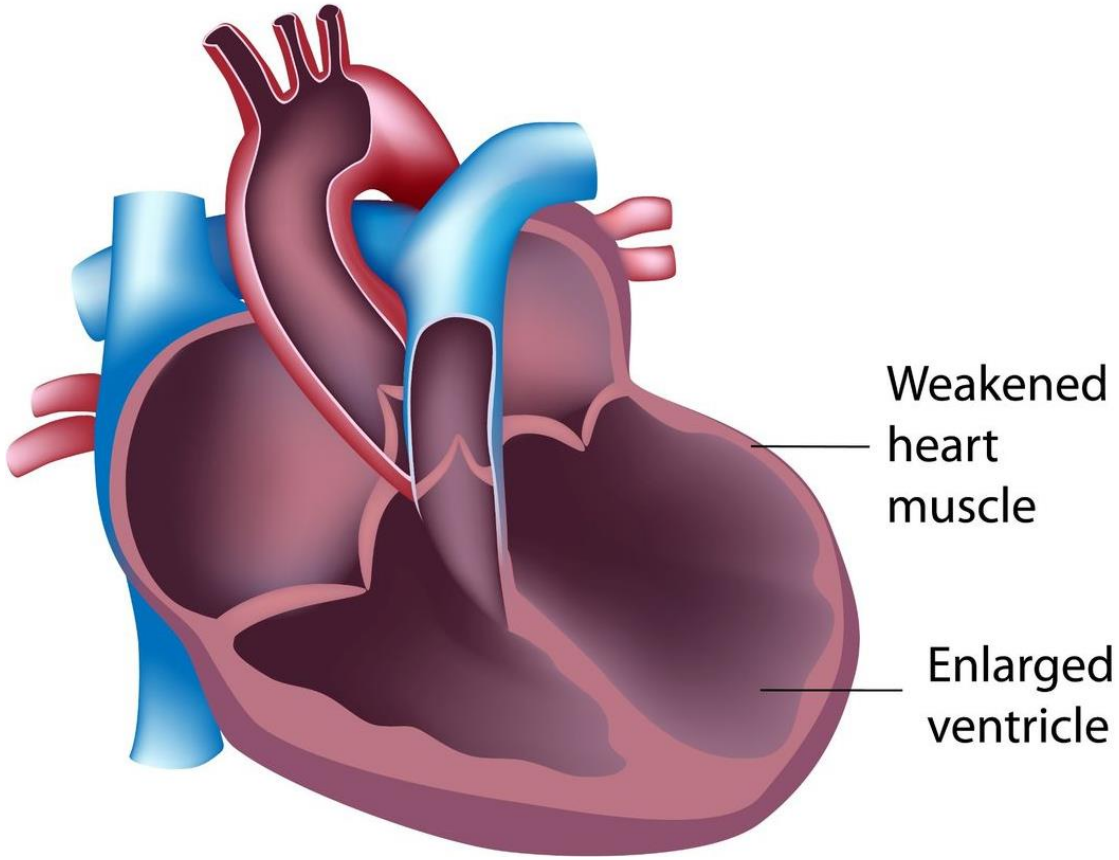
	Class/level of evidence
1. Athletes with incidental discovery of LV hypertrabeculation should not be diagnosed as LVNC in the absence of symptoms, positive family history, abnormal ECG patterns and, most importantly, impaired LV function. In such cases, no restriction for all competitive sports apply.	Class IIa/Level B
2. Athletes with unequivocal/reasonable diagnosis of LVNC but near-normal LV systolic function may participate in all competitive sports, with the exception of those where occurrence of syncope may cause serious harm or death (*Figure 1*), if they are: (1) asymptomatic, (2) without frequent and/or complex ventricular arrhythmias, or non-sustained VT on ambulatory monitoring and exercise ECG testing, and (3) no prior history of unexplained syncope	Class IIb/ Level C
3. Athletes with an unequivocal diagnosis of LVNC and (1) impaired LV systolic function and/or (2) frequent and/or complex ventricular arrhythmias, or non-sustained VT on ambulatory monitoring or exercise testing should be advised to abstain from participation in competitive sports. These patients should be advised to limit their exercise programmes to leisure-time physical activities and remain under regular clinical surveillance.	Class III/ Level C

Sport en LVNC



- Bij afwezigheid risico-markers

Sport en DCM



DCM

- Niet één specifieke ziekte
- Genetische en/of omgevingsfactoren

TABLE 1 Causes of DCM

Cause	Examples	Routine Work-Up	Selective Work-Up
Idiopathic			
Genetic	See Table 3	Detailed family history ECG (AV block) [*LMNA*]* Ferritin and transferrin saturation [hemochromatosis]*	Clinical screening of first-degree relatives if no other cause for DCM identified. Consider genetic testing if familial involvement, AV block, or raised ferritin/transferrin saturation.
Toxins	Alcohol, amphetamines, cocaine, anthracyclines (e.g., doxycycline), trastuzumab, clozapine, chloroquine, carbon monoxide, cobalt, lead, mercury	Detailed history of toxin exposure GGT, LFT, MCV	Urine toxicology screen if high suspicion of cocaine/amphetamine abuse.
Infectious	Viral • Adenovirus, Coxsackie A and B, cytomegalovirus, Epstein-Barr, human herpes virus 6, HIV, parvovirus B19, varicella Bacterial • Brucellosis, diphtheria, psittacosis, typhoid fever Fungal Spirochetal • Borreliosis (Lyme disease), Leptospirosis (Weil disease) Protozoal • Chagas disease, schistosomiasis, toxoplasmosis Rickettsial	Troponin	HIV serology in all patients with risk factors and/or unexplained DCM *Trypanosoma Cruzi* serology if travel to or residence in Central/South America. Consider EMBx if suspicion of myocarditis (see "Inflammatory cardiomyopathy and the role of endomyocardial biopsy," p. 2997) Targeted serological testing if suspected Lyme disease or rickettsial infection.
Metabolic/endocrine	Electrolyte disturbances • Hypocalcemia, hypophosphatemia, uremia Endocrine abnormalities • Cushing's disease, acromegaly hypo/hyperthyroidism, pheochromocytoma Nutritional deficiencies • Carnitine, thiamine, selenium	Urea, creatinine, Na, K, Ca, PO_4 Thyroid function tests Plasma glucose Urinary metanephrines	Targeted endocrine investigations if suggestive clinical features. Trace element/nutritional screen if significantly malnourished.
Inflammatory/infiltrative/autoimmune	Hypersensitivity myocarditis Infiltrative diseases • Hemosiderosis, sarcoidosis Vasculitis • Churg-Strauss, Kawasaki disease, polyarteritis nodosa Connective tissue disorder • Scleroderma • Dermatomyositis • Systemic lupus erythematosus	ESR, CRP ECG (AV block), CXR (hilar lymphadenopathy), and serum ACE [sarcoidosis]*	EMBx if suspicion of sarcoidosis or vasculitis (unless confirmed extracardiac disease and myocardial involvement demonstrable on imaging). Autoantibody screen if raised ESR/CRP or skin/joint/systemic features.
Neuromuscular disease	Dystrophinopathies (Duchenne/Becker muscular dystrophy/X-linked DCM) Limb-girdle muscular dystrophies Facioscapulohumeral muscular dystrophy Emery-Dreifuss muscular dystrophy Friedreich's ataxia Myotonic dystrophy	Creatine kinase Skeletal muscle weakness Family history (X-linked inheritance pattern†), ECG ("posterolateral infarction"), echo (posterolateral akinesia/dyskinesia) [dystrophinopathies]* Gait ataxia [Friedreich's ataxia]* Myotonia/cataracts [myotonic dystrophy]* ECG (AV block) [Emery-Dreifuss type 1/myotonic dystrophy]*	Specialist evaluation ± muscle biopsy/electromyography/genetic testing if muscle weakness, elevated creatine kinase, or other cardiac/extracardiac markers.
Other	Pregnancy		
	Tachyarrhythmia	12-lead ECG	Ambulatory ECG monitoring.

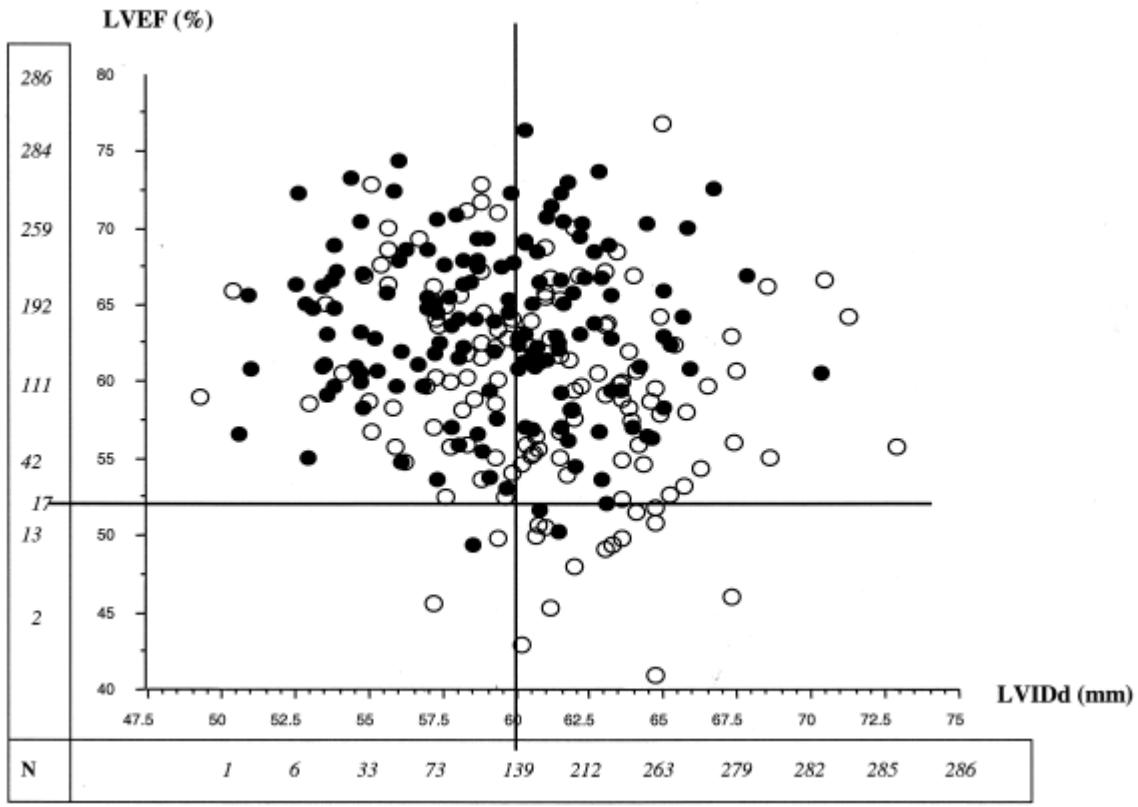
*Specific causes of DCM to which the aforementioned diagnostic tests apply. †X-linked inheritance pattern: principally males affected, no male–male transmission.

ACE = angiotensin-converting enzyme; AV = atrioventricular; CRP = C-reactive protein; CXR = chest x-ray; DCM = dilated cardiomyopathy; ECG = electrocardiogram; Echo = echocardiography; EMBx = endomyocardial biopsy; ESR = erythrocyte sedimentation rate; GGT = gamma-glutamyl transferase; HIV = human immunodeficiency virus; LFT = liver function tests; *LMNA* = lamin A/C gene; MCV = mean corpuscular volume.

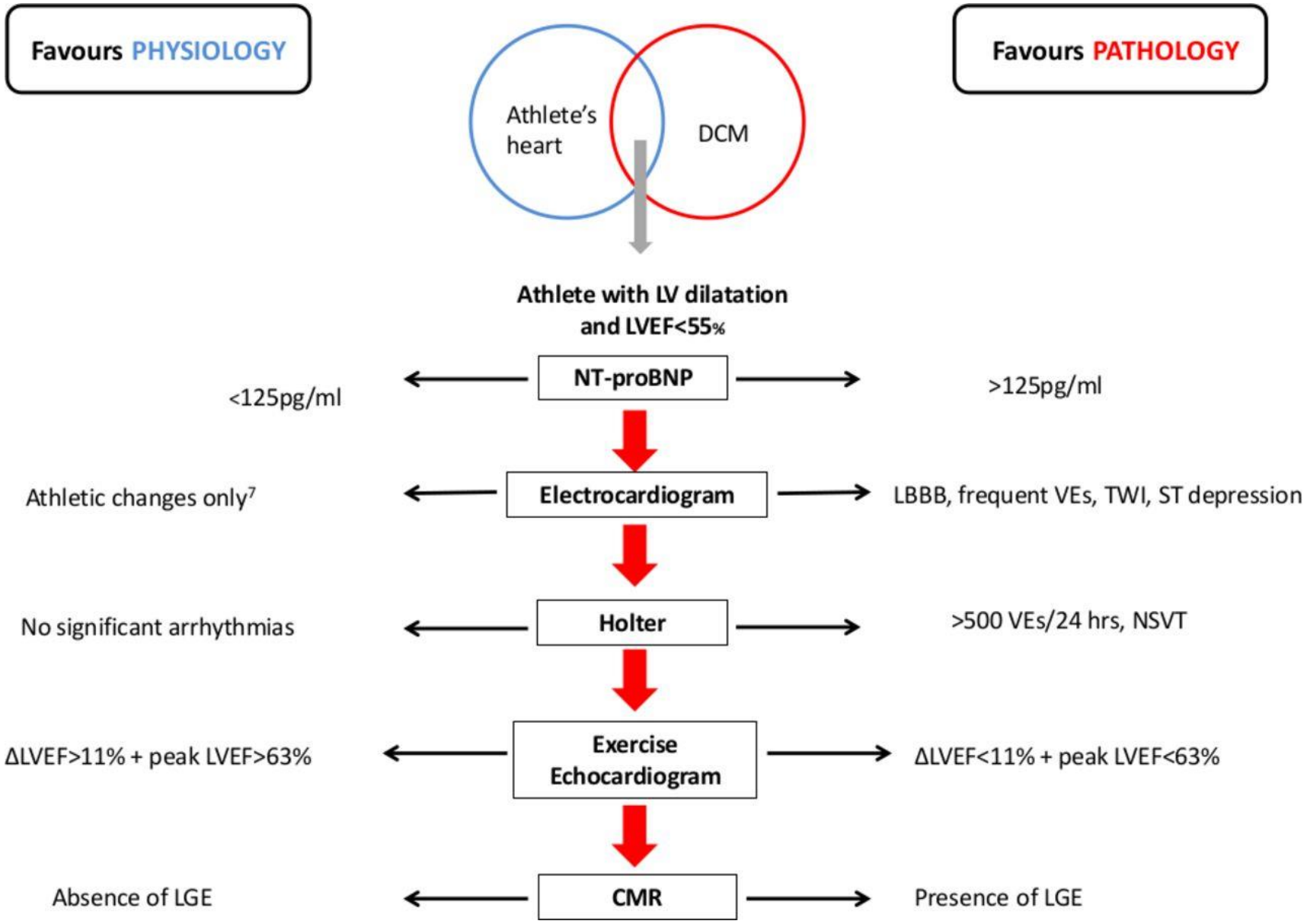
Japp et al., 2016

Dimensies in sporters - DCM

- Onderscheid adapatie bij sport/ ziekte kan uitdagend zijn
- LVEDd >60mm in 15% mannelijke sporters
- Afname LVEF bij toename LVEDd, tot LVEF 40%



Abergel et al, 2004
Pelliccia et al., 1999



Millar et al., 2020

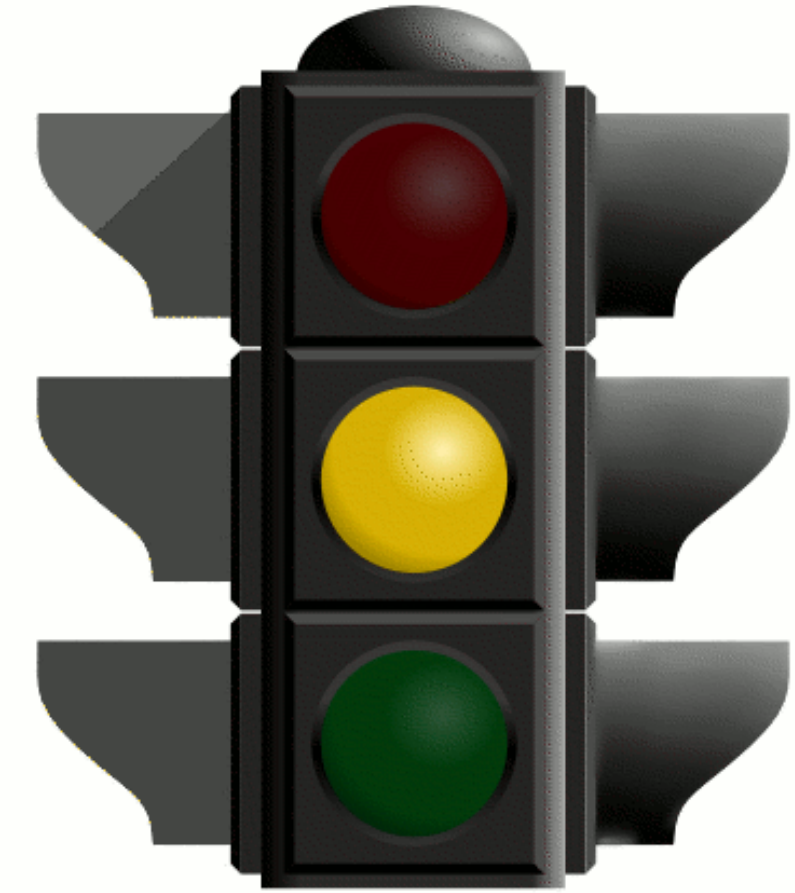
Wanneer altijd stoppen

- Symptomen
- Familieanamnese SCD/SCA
- Bekende mutatie (Lamine A/C, PLN)
- LVEF <40%
- LGE ≥20%
- VTs
- Syncope

Table 3 **Recommendations for athletes with DCM**

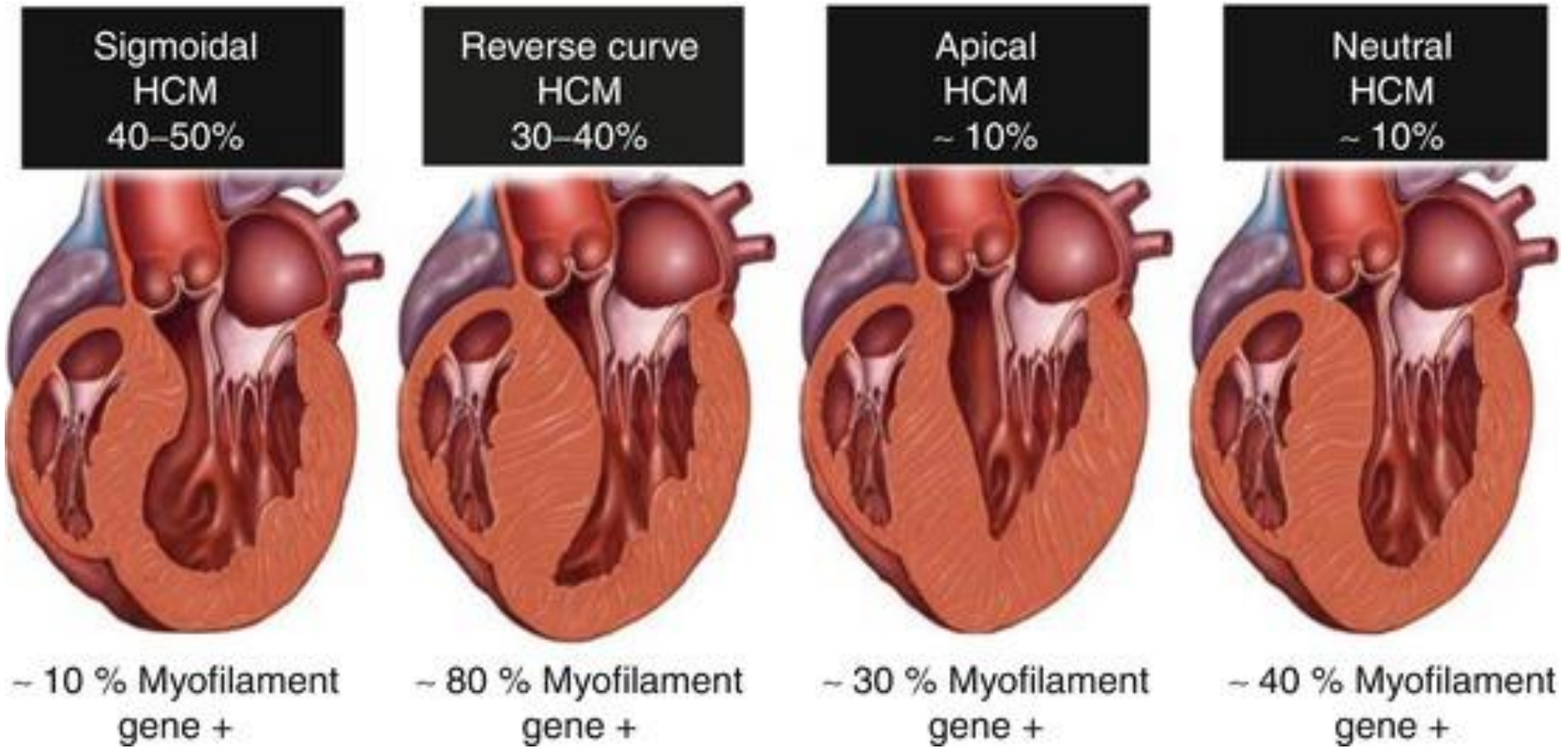
	Class/level of evidence
1. The presence of LV cavity dilatation with preserved LV function, in the absence of a family history of DCM, abnormal ECG patterns, and atrial/ventricular tachyarrhythmias should be considered to represent expression of physiological cardiac remodelling rather than DCM. Therefore, no restriction to competitive sports is applicable to this cohort of athletes.	Class IIa/Level B
2. Athletes with an unequivocal diagnosis of DCM, but mildly reduced LV systolic function (EF ≥40%) may selectively engage in all competitive sport, with the exception of those where occurrence of syncope may be associated with serious harm or death (*Figure 1*), if they are: (1) Asymptomatic, (2) Without prior history of unexplained syncope, and (3) Without frequent/complex ventricular tachyarrhythmias on ambulatory ECG monitoring and exercise testing. Exceptions include patients with a family history of SCD/CA and/or those previously identified during cascade screening for familial DCM, with mutations that are associated with an increased risk of life-threatening arrhythmias (such as Lamin A/C or Filamin C mutation), irrespective of the severity of LV dysfunction and dilatation. These patients should be advised not to engage in competitive sports.	Class IIb/Level C
3. Athletes with a diagnosis of DCM who are: (1) symptomatic, or have (2) LV ejection fraction <40%, or (3) extensive LGE (i.e. >20%) on CMR and/or (4) frequent/complex ventricular tachyarrhythmias on ambulatory ECG monitoring and exercise testing, or (5) history of unexplained syncope. should be advised not to engage in competitive sports. These patients should be advised to limit their exercise programmes to leisure-time activities and undergo regular clinical surveillance, consistent with current recommendations for the management of DCM.	Class III/Level C

DCM



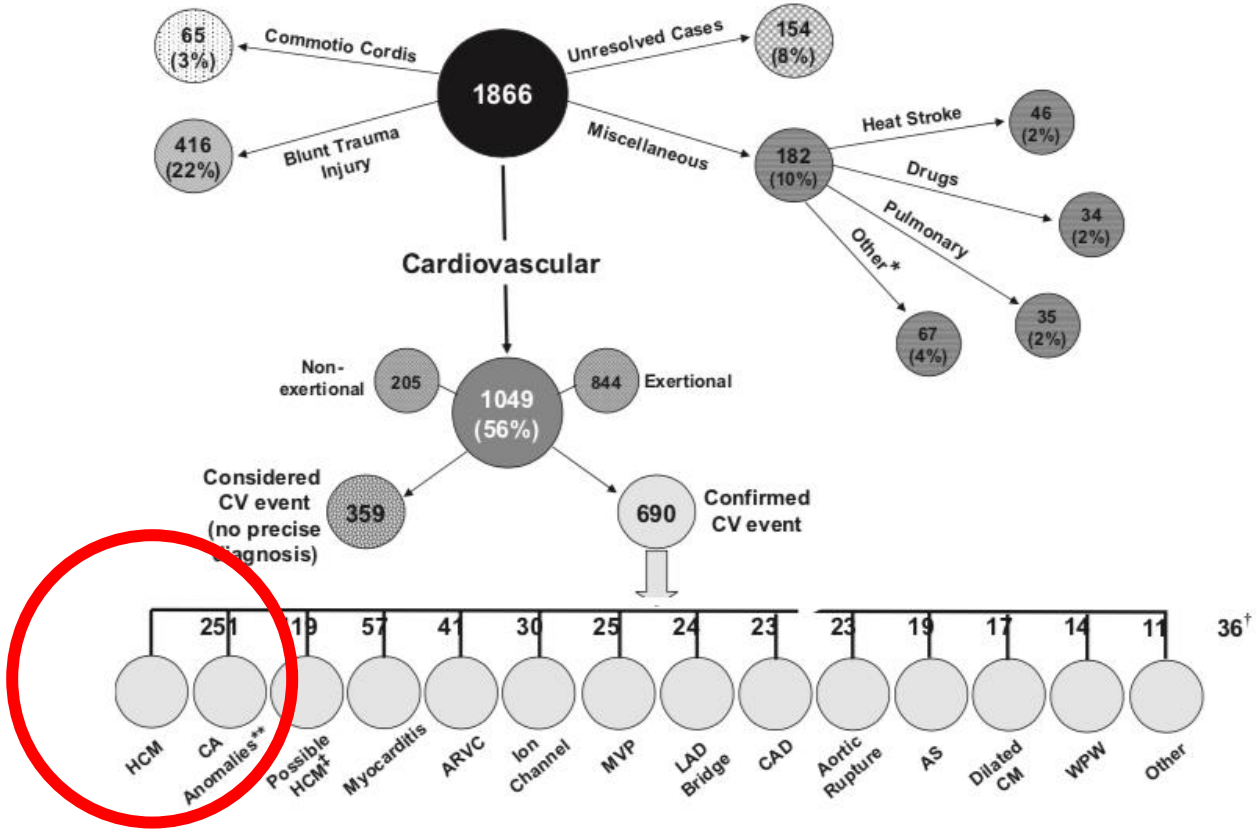
- Differentiatie uitdagend
- Bij aanwezigheid risicomarkers: voorzichtigheid geboden

Sport en HCM


Sigmoidal HCM 40–50%
Reverse curve HCM 30–40%
Apical HCM ~ 10%
Neutral HCM ~ 10%
~ 10 % Myofilament gene +
~ 80 % Myofilament gene +
~ 30 % Myofilament gene +
~ 40 % Myofilament gene +

Sporten als trigger SCA/ SCD?

- Registry VS 27 jaar (1980 – 2006)
- 1866 SCA/ plotse (hart-)dood



Maron et al., 2009

Nadelige effecten sporten?

SCA/ SCD

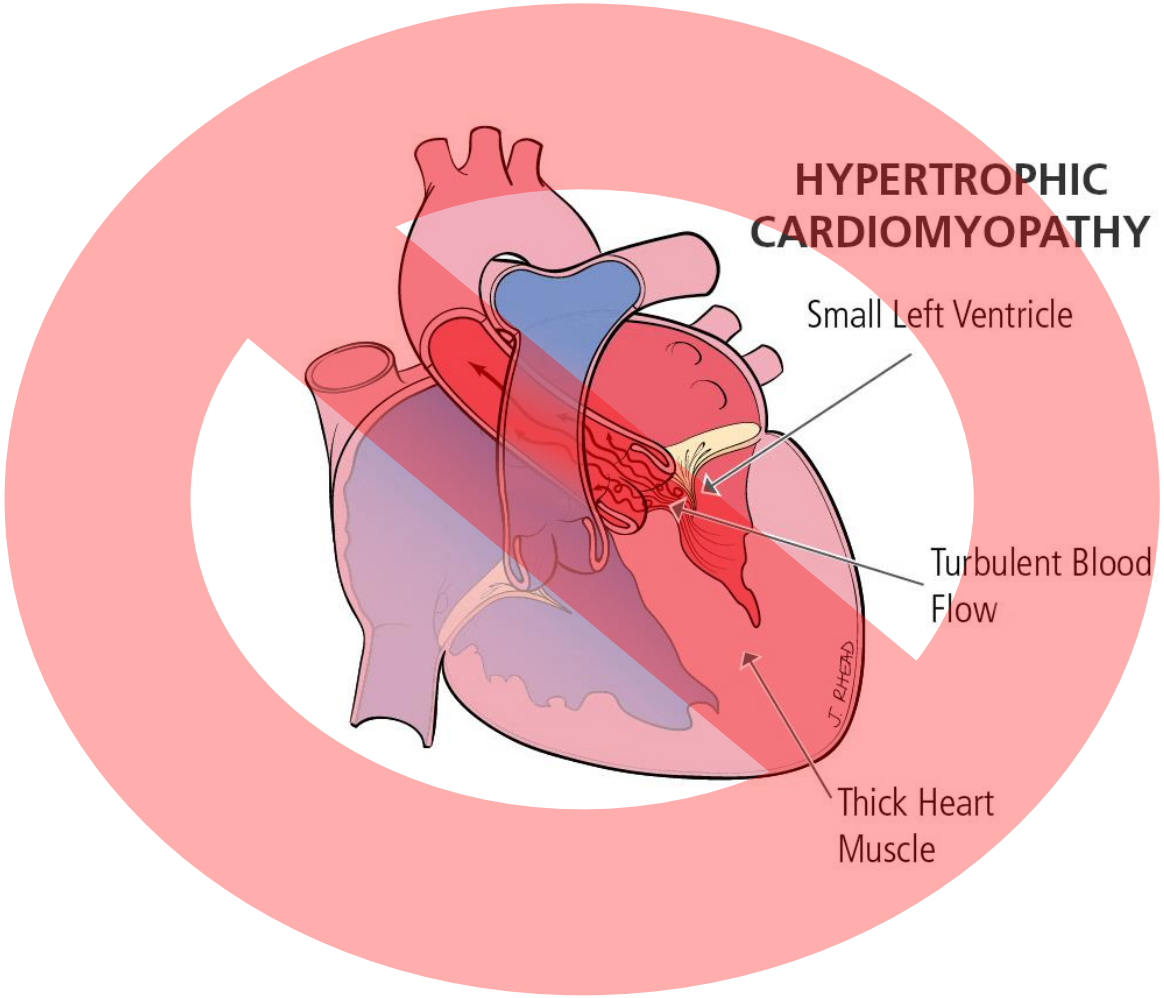
- Dehydratie
- Veranderingen bloedvolume
- Veranderingen elektrolyten
- Catecholaminen
- Lactaat/ pH ?

Expert opinion en circumstantieel bewijs

Maron et al., 2015

HCM

- HCM traditioneel gezien als **absolute contraindicatie** competitieve sport
- Oude richtlijnen (inclusief Task Force 3 2015) **=> stopadvies**



Doorgaan met sporten?

- HCM N=35 sporters (33 man)
- 5 – 31 jaar sporten
- Internationaal tot regionaal competitief niveau
- Stopadvies aan iedereen
- 15 hielden zich niet aan advies

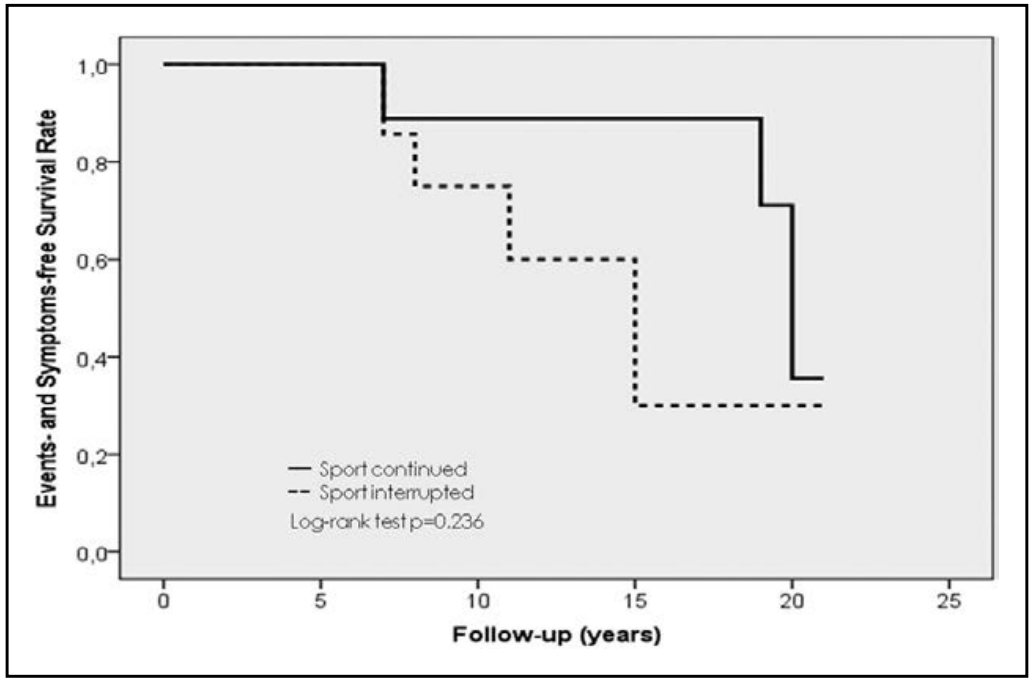


Figure. Kaplan-Meier analysis of survival-free from event/symptoms in athletes with HCM over the follow-up, according to their participation in regular exercise programs and sport competitions.

Pelliccia et al., 2018

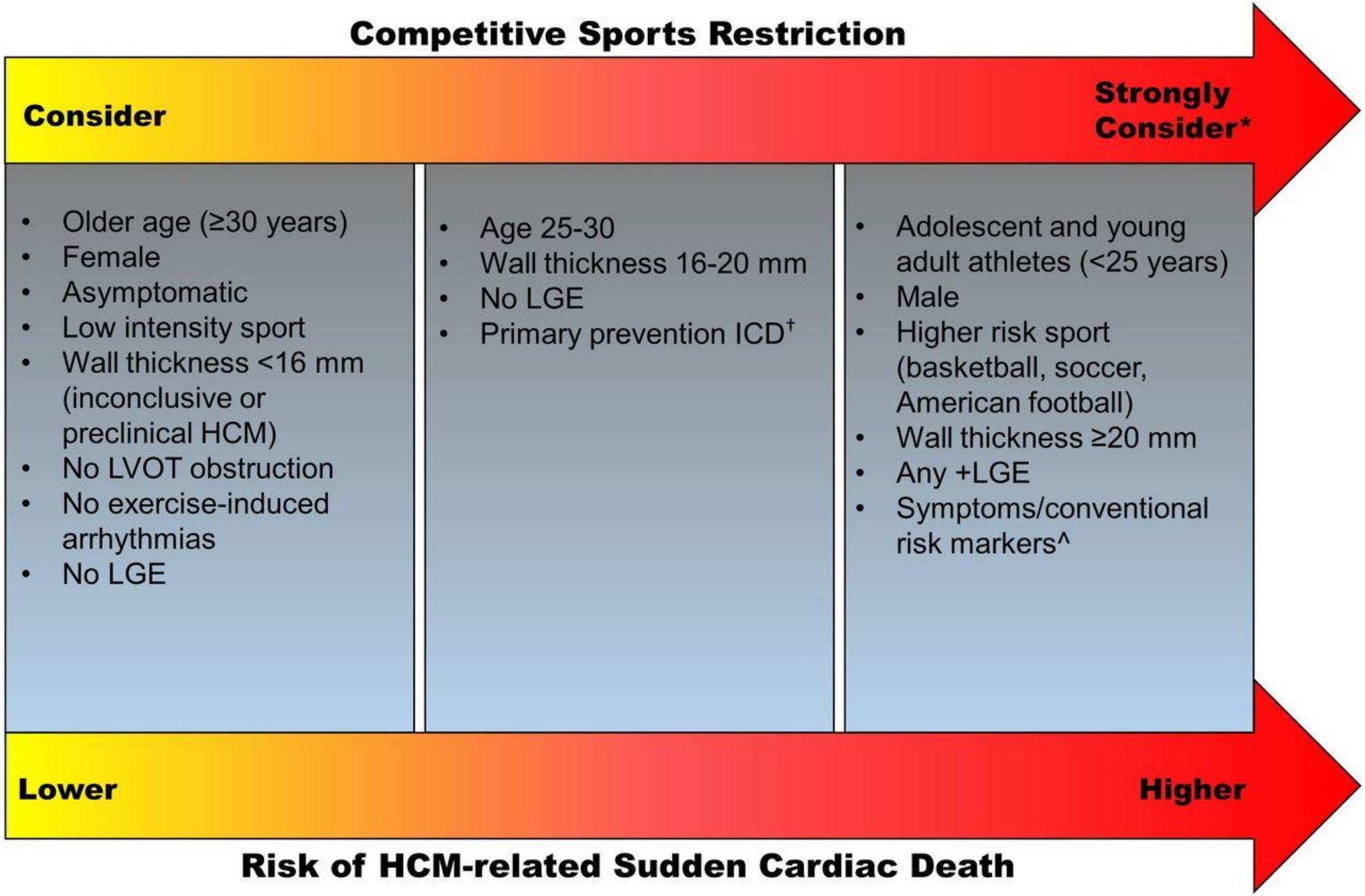
Sportadvies bij HCM

- Systematische benadering
- Expert opinion van toegevoegde waarde

Zoek naar risicomarkers:

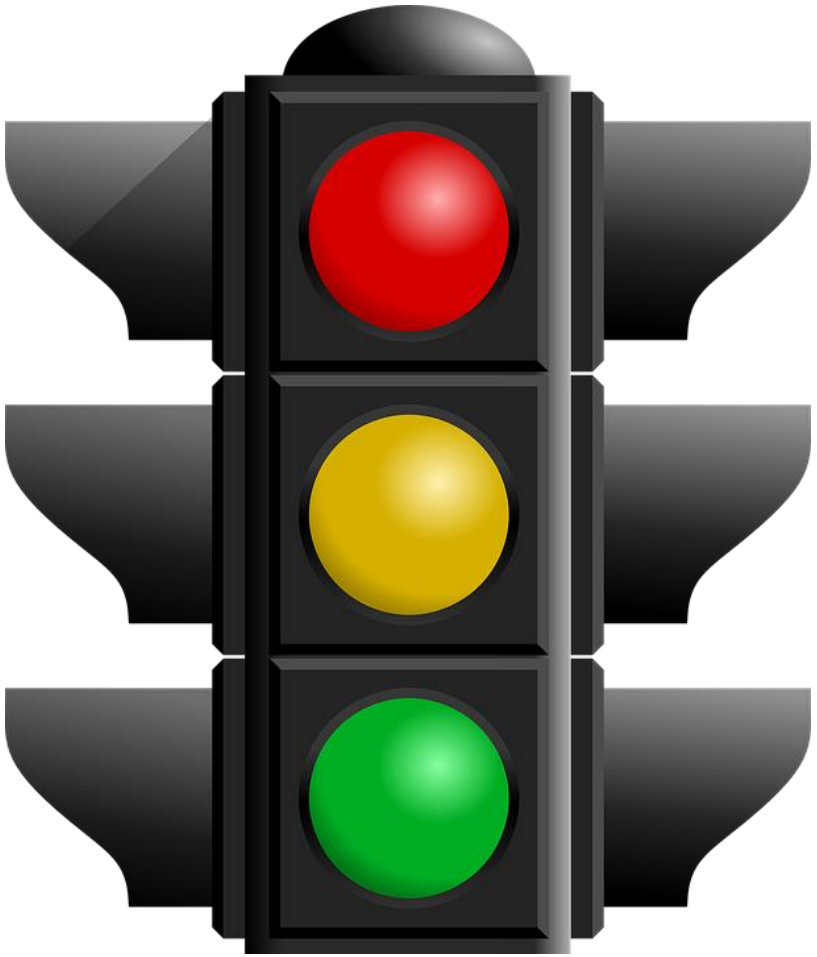
- Symptomen/ syncope
- 5-jaar ESC SCD HCM risk score ≥4%
- LVOT gradient >30 mmHg in rust
- Abnormaal bloeddrukrespons bij inspanning
- Inspanningsgebonden aritmieën

Drezner et al., 2021



Drezner et al., 2021

HCM



Individueel advies

Yakult

Scotiabank
ED

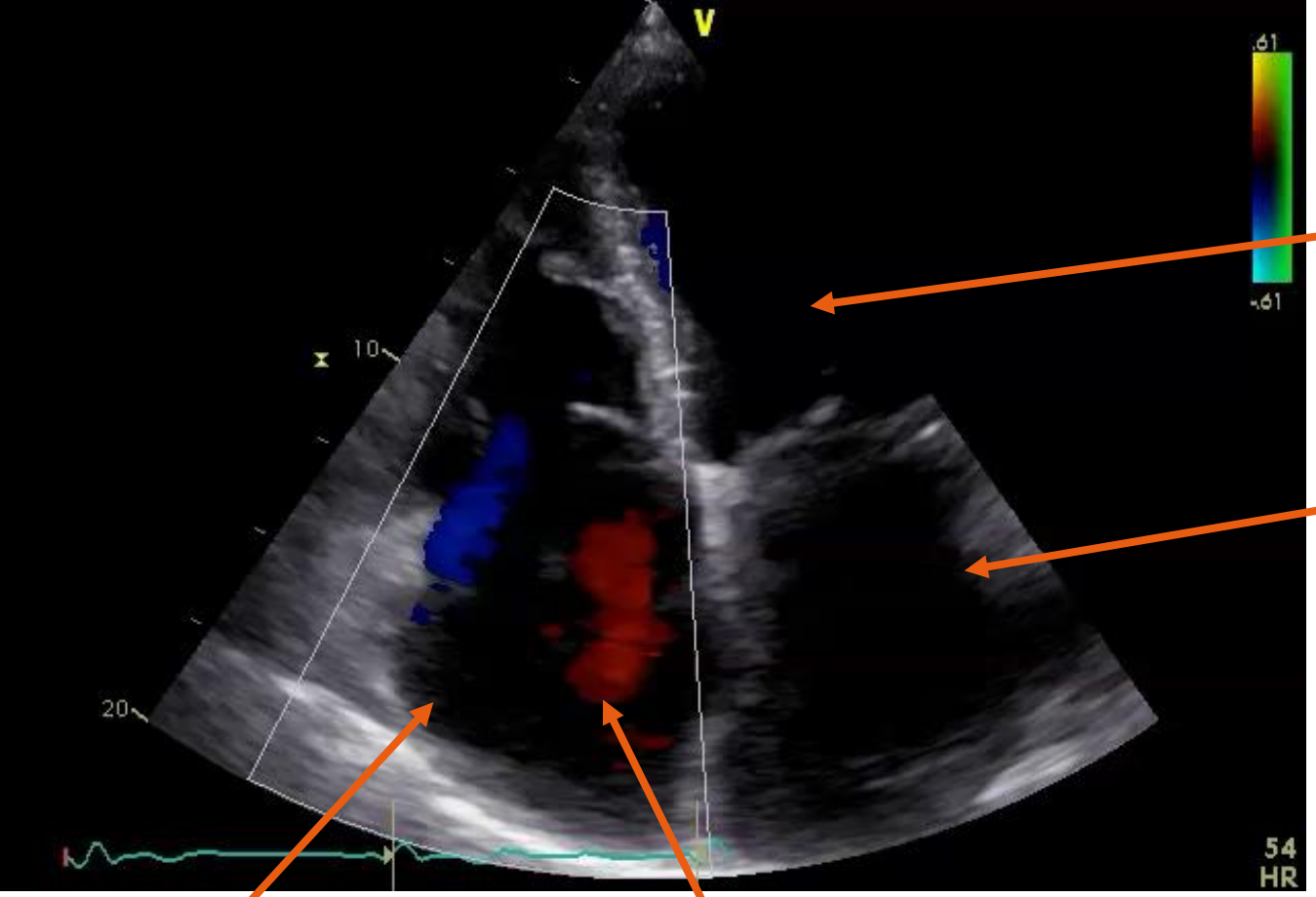
Casus: de oude sporter

- Man 74 jaar
- Komt voor sportadvies

V
.61
-.61
10
20
V
10
20
54
HR
58
HR

Wordcloud

Wat is uw sportadvies?



- Hooguit redelijke LVF
- LAVI 200ml/m2
- Chronisch AF
- RA fors gedilateerd
- Ernstige TI
- Pacemaker symptomatische bradycardieen
- Rx/ OAC, betablokker, furosemide, ARNI

Sporten in de oude patiënt met CMP

Age-related moderate effort activities

- walking
- water aerobics
- ballroom and line dancing
- riding a bicycle on level ground or with few hills
- doubles tennis
- pushing a lawn mower
- canoeing
- volleyball

Sporten in de oude patiënt met CMP

Age-related intense effort activities

- jogging or running
- aerobics
- swimming fast
- riding a bicycle fast or on hills
- singles tennis
- football
- hiking uphill
- energetic dancing
- martial arts

Overwegingen

- **Algemene risico's**
  - Spier- en gewichtsklachten
  - Blessures/ fracturen
  - Risico op vallen
- **Specifieke risico's**
  - Antistolling
  - Aritmieen
  - RR
  - Ischemie
  - Progressie hartfalen

- **Echter…**
  - Enorm ervaren in sporten
  - Is er al oud mee geworden (!)
  - Kent eigen lichaam
  - Winst voor alle andere orgaansystemen

- **Kwaliteit van leven**
  - Voorkeur patiënt weegt sterk mee

Sportanamnese

- Duursport sinds 1965
- 20 jaar wielrennen, 17 jaren met amateuren, aantal jaren met veteranen
- Triathlons 5x, 5x marathon
- Cyclo sportief 5x in jaren 90

Huidig

- Sporturen 14 u/wk
- Fietst elke ochtend 2u, 40-50km
- Bij slecht weer hardlopen, 8 km rustig tempo, lopen - hardlopen

Specifieke sportadviezen

- Zeg nooit ‘doe rustig aan’
- Probeer specifieke sporten te identificeren die wél kunnen
- Probeer hoeveelheid en intensiteit af te spreken

- Alleen op indicatie hartslagadviezen meegeven
  - Bij (S)VTs
  - Ziektespecifieke adviezen

- <u>Bij twijfel: consult sportcardioloog, eventueel samen met sportarts</u>

THE NETHERLANDS SPORTS CARDIOLOGY MAP

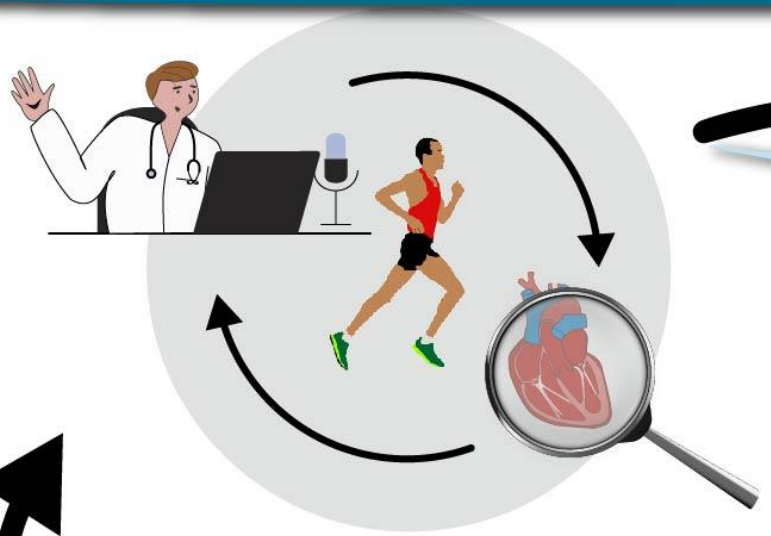
*IRB=Institutional Review Board

Cardiology department/clinic	High Performance Partner Team NL	City	Primary contact (cardiologist)	Specific expertise	Collaboration with sports club or sports federation	Multi-Disciplinary Meeting	IRB* approved research projects
Admiraal de Ruyter Hospital (ADRZ)		Goes – Vlissingen - Zierikzee	Dr. M.H.H. De Vaan	Diving			
Amsterdam UMC	Yes	Amsterdam (AMC & VUmc) - Papendal	Dr. H.T. Jorstad	Elite sports - soccer – tennis – cycling – rowing – endurance sports – field hockey – water polo	AFC Ajax – KNLTB – KNVW – NOC*NSF	Cardiologists, sports physicians, Cardiac EP**, genetics, radiologists, pulmonologist, paediatric cardiologists	Yes
Canisius Wilhelmina Hospital (CWZ)		Nijmegen	Dr. E.S. Zegers	Soccer	NEC		
CardioExpert		Bunnik	Dr. R. Rienks	Diving – elite sports – soccer – high altitude sports – flying – extreme sports	KNVB		
CCN, Amsterdam UMC, location AMC		Amsterdam	Dr. M. Speleman			At Amsterdam UMC	
ErasmusMC		Rotterdam	Dr. T.W. Galema	Soccer	Feyenoord		
Flevohospital		Almere	Dr. N. Bijsterveld			At Amsterdam UMC	
Haaglanden Medical Centre (HMC)		Leidschendam (Antoniushove) – Den Haag (Westeinde)	Dr. B.J. Sorgdrager	Soccer - cycling – endurances sports – field hockey - diving	ADO - KNVB	Cardiologists, sports physicians, pulmonologists	
Hartdokters		Amsterdam KG/W*** -Leiden-Noordwijk	Dr. J.J. Regieli	Diving - altitude sports - cycling - running			
Heilig Hart Hospital (Sportgeneeskunde.nl)		Mol, België – Oss	Dr. J.P.M. van Asseldonk	Soccer	TOP Oss		
Hospital Gelderse Vallei (ZGV)		Ede	Dr. M.J. van der Veen		Sports Valley	At Amsterdam UMC	
Isala Hospital		Zwolle	Dr. J.R. Timmer	Speed skating	PEC Zwolle - Lotto Jumbo	Cardiologists and sports physicians	
Laurentius Roermond		Roermond	Drs. R. van der Borgh	Endurance sports – altitude sports	Sunweb cycling team		
Maastricht UMC		Maastricht	Dr. C. Knackstedt		Boels-Dolmans Cycling		
Martini Hospital Groningen		Groningen	Dr. J.L. Posma	Soccer – basketball	FC Groningen - Donar basketball		
Maxima MC	Yes	Veldhoven	Dr. J. Hoogsteen	Elite sports - speed skating – cycling – soccer	PSV – Jumbo-Visma – CSC – NOC*NSF	Cardiologists and sports physicians	Yes
Meander MC	Yes	Amersfoort	Dr. P.J. Senden	Elite sports - soccer – cycling	FC Utrecht – NOC*NSF	Cardiologists, sports physicians, pulmonologists, radiologists	
Medical Spectrum Twente (MST)		Enschede	Dr. M.F. Scholten				
Noordwest Hospitalgroup (NWZ)		Alkmaar	Dr. G.P. Kimman	Soccer	AZ	Cardiologists and sports physicians	
OLVG-West	Yes	Amsterdam	Dr. A.R. Willems	Elite sports	NOC*NSF	At Amsterdam UMC	
Regional hospital Koningin Beatrix (SKB)		Winterswijk	Dr. P. Sijbring	Soccer	De Graafschap		
RKZ Beverwijk/CCN		Beverwijk - Ijmond	Drs. M.A.C. Koole	Cycling – speed skating - running - rowing – strength training	Telstar		
St. Anna hospital		Geldrop	Dr. J.H.P. Janssen	Swimming – soccer	PSV – VVV – PSV swimming - Helmond Sport		
St. Elisabeth hospital		Tilburg	Dr. A.C.B. Pronk	Soccer	Willem II		
SXB Hardenberg		Hardenberg	Dr. J.T. Drost	Endurance sports	PEC Zwolle Woman	Cardiologists, sports physicians, rehabilitation physicians	
Tjongerschans hospital		Heerenveen	Dr. S.T. de Vries	Speed skating - marathon - triathlon - soccer	SC Heerenveen		
UMC Utrecht, Central Militair Hospital		Utrecht	Prof. P.A.F. Doevedans	Soccer	FC Utrecht		
Wilhelmina Hospital Assen (WHA)		Assen	Drs. J.K. Jongman			Cardiologists and sports physicians	

*IRB=Institutional Review Board ** Cardiac EP=Cardiac Electrophysiologists *** KG/W=Klein Gooioord/West

Neth Heart J. Hattum, … Jorstad 2020

The sports cardiology multidisciplinary team design



Information presented to the panel:
- Reason for referral
- Background, family/personal/sports history, physical examination, function tests*, imaging*
- Preliminary diagnosis
- Preliminary Sports advice
- References to current guidelines and/or research articles

MDT core panel members:
- SEM**
- Sports cardiology
- Cardiogenetics
- Clinical genetics
- Paediatric cardiology
- Cardiovascular imaging
- Electrophysiology

MDT review process:
- Plenary discussion until consensus
- Conflicting advice is weighted by voting

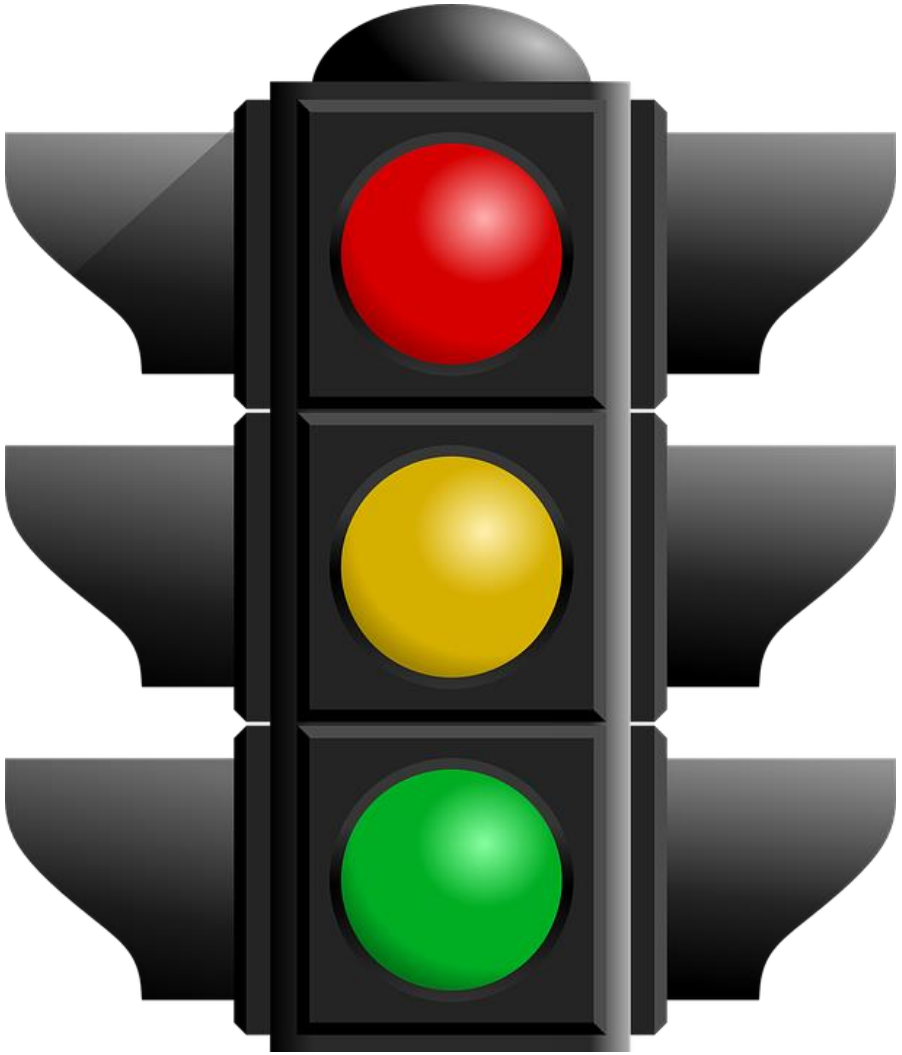
In case of insufficient information:
- Additional testing or additional expert opinion recommended

Panel consensus document:
- Diagnosis
- Sports advice
- Diagnostic/treatment advice

Casus aanmelden:
sportcardiologie@amsterdamUMC.nl

Hattum… Jorstad, under review

Take home: Sport en CMP



ARVC patiënten én gendragers

DCM

LVNC

HCM

Vragen? Casus inbrengen?

h.t.jorstad@AmsterdamUMC.nl

sportcardiologie@AmsterdamUMC.nl