

ARTIS

Zoobiqquity: Hartonderzoek bij mensapen

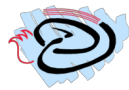
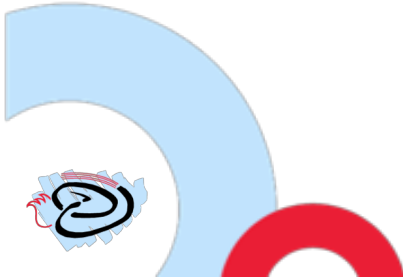


NHVV Nederlandse
Hartfunctie
Vereniging



Dr Robert Riezebos, cardioloog





Disclosure belangen spreker

(Potentiële) belangenverstrengeling Geen

Voor bijeenkomst mogelijk relevante -
relaties met bedrijven

Sponsoring of onderzoeksgeld -


Honorarium of andere (financiële) -
vergoeding

Aandeelhouder -

Andere relatie, namelijk ... -

Amsterdamse geschiedenis: 19^e eeuwse gordel



An aerial photograph of Amsterdam, East, showing a mix of modern high-rise apartment buildings and older, lower-rise residential structures. A dark grey diagonal line runs from the top left towards the bottom right, partially obscuring the view. The modern buildings have light-colored facades and some have distinctive architectural features like blue and white striped patterns. The older buildings are more densely packed and have varied rooflines. Green spaces and trees are interspersed throughout the urban landscape.

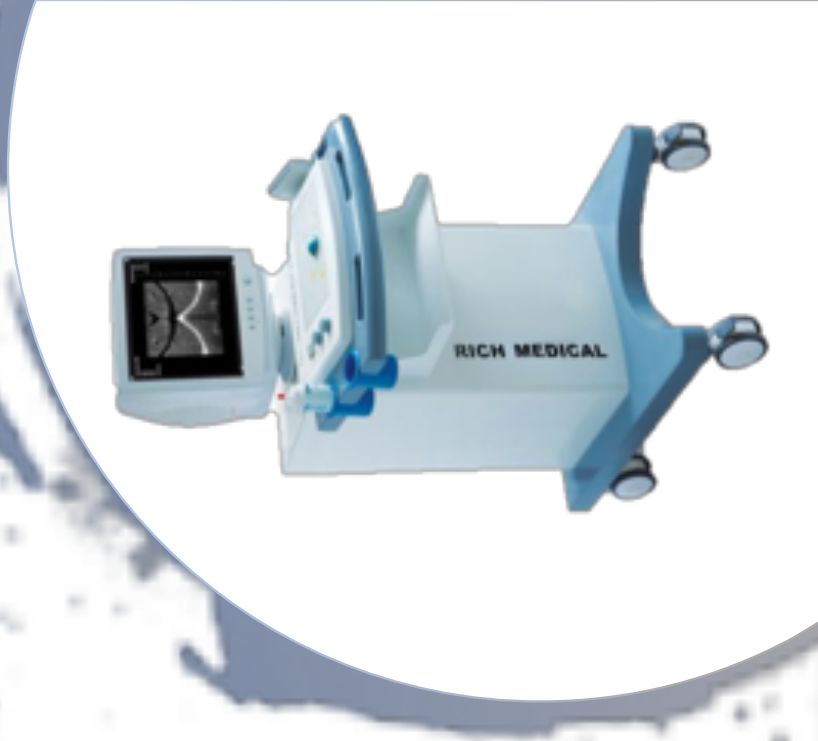
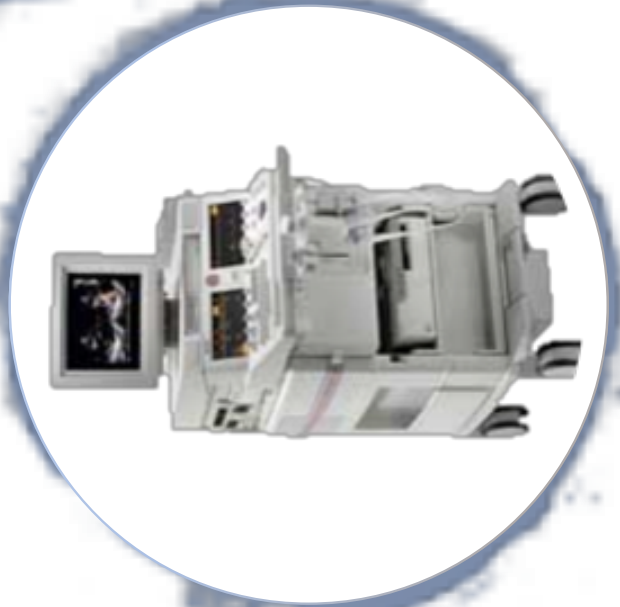
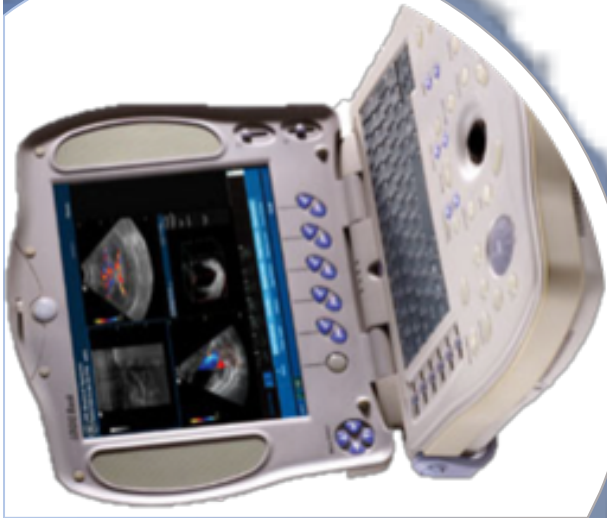
Amsterdam – de iconen van Oost

OLVG Hartcentrum

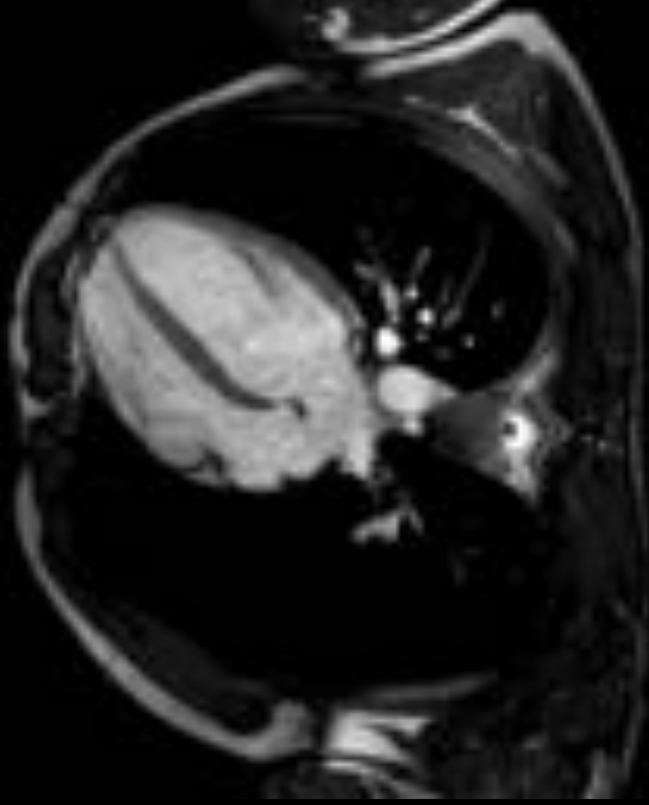
- Het OLVG heeft een van de grootste high tech hartcentra in Nederland.
- OLVG biedt het volledige pallet aan cardiale diagnostiek en behandelingen.
- Behandelingen worden veelal minimaal invasief verricht.



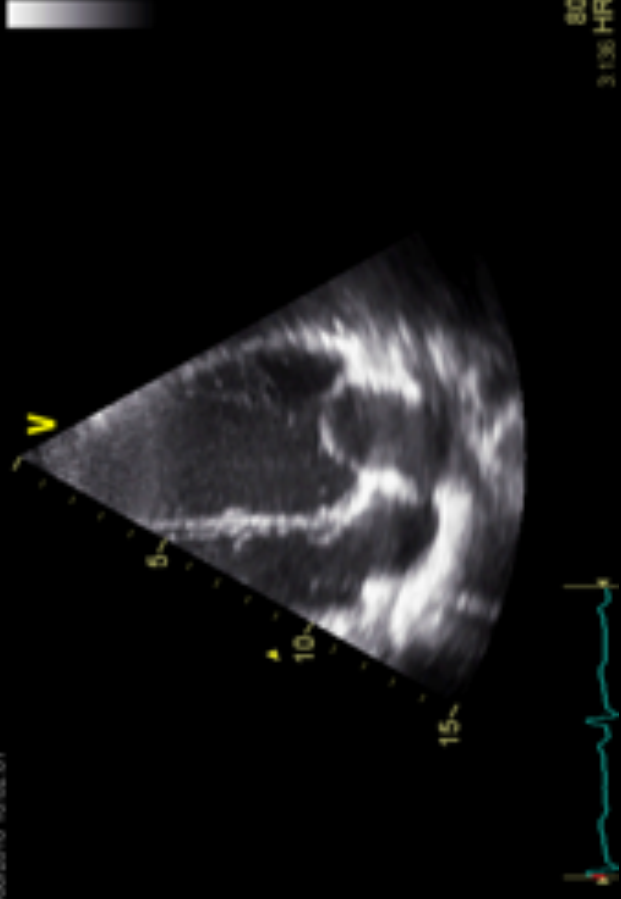
Evolutie van van echo apparatuur



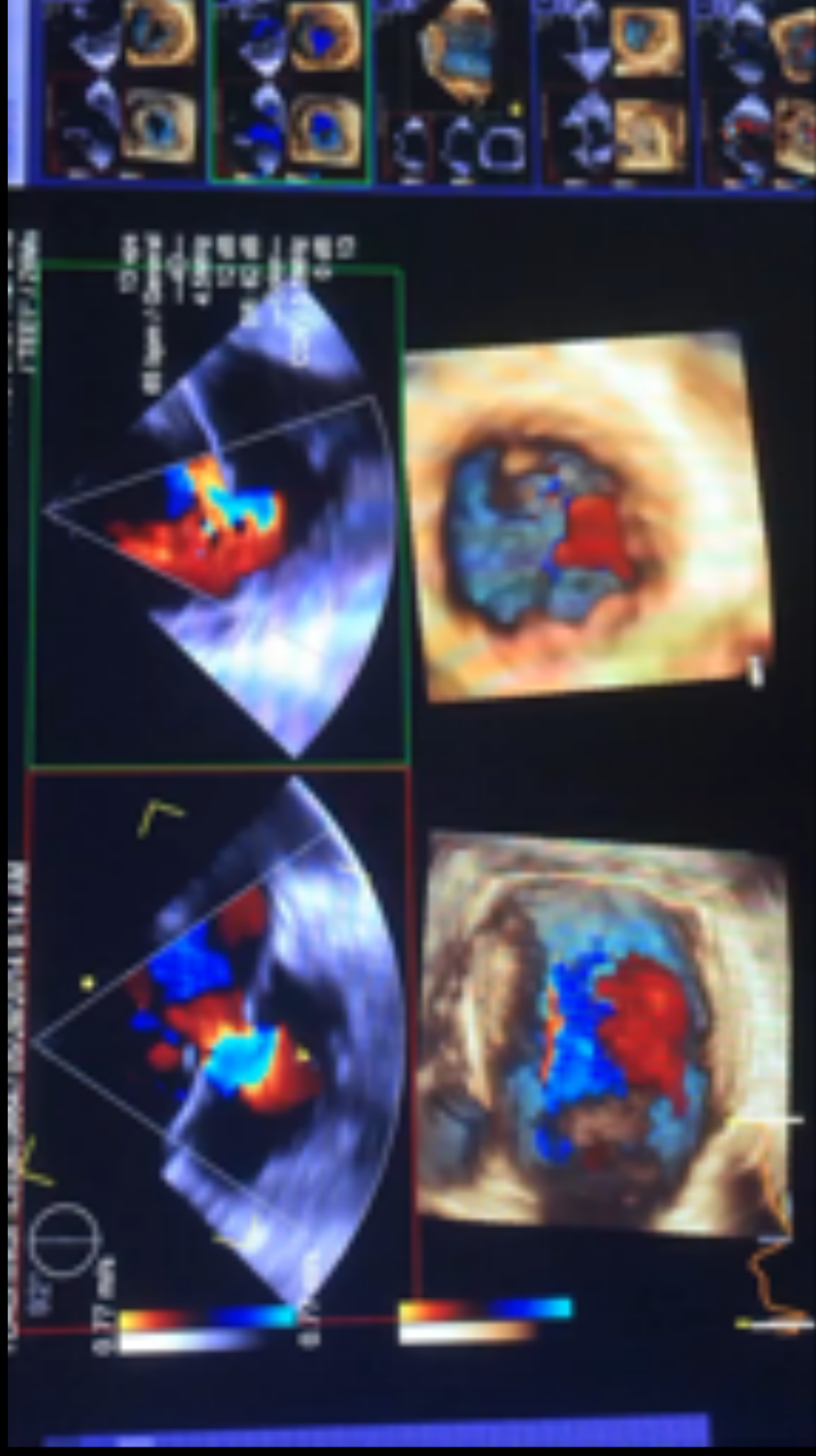
Normale humane cardiale functie



28/06/2010 10:02:01

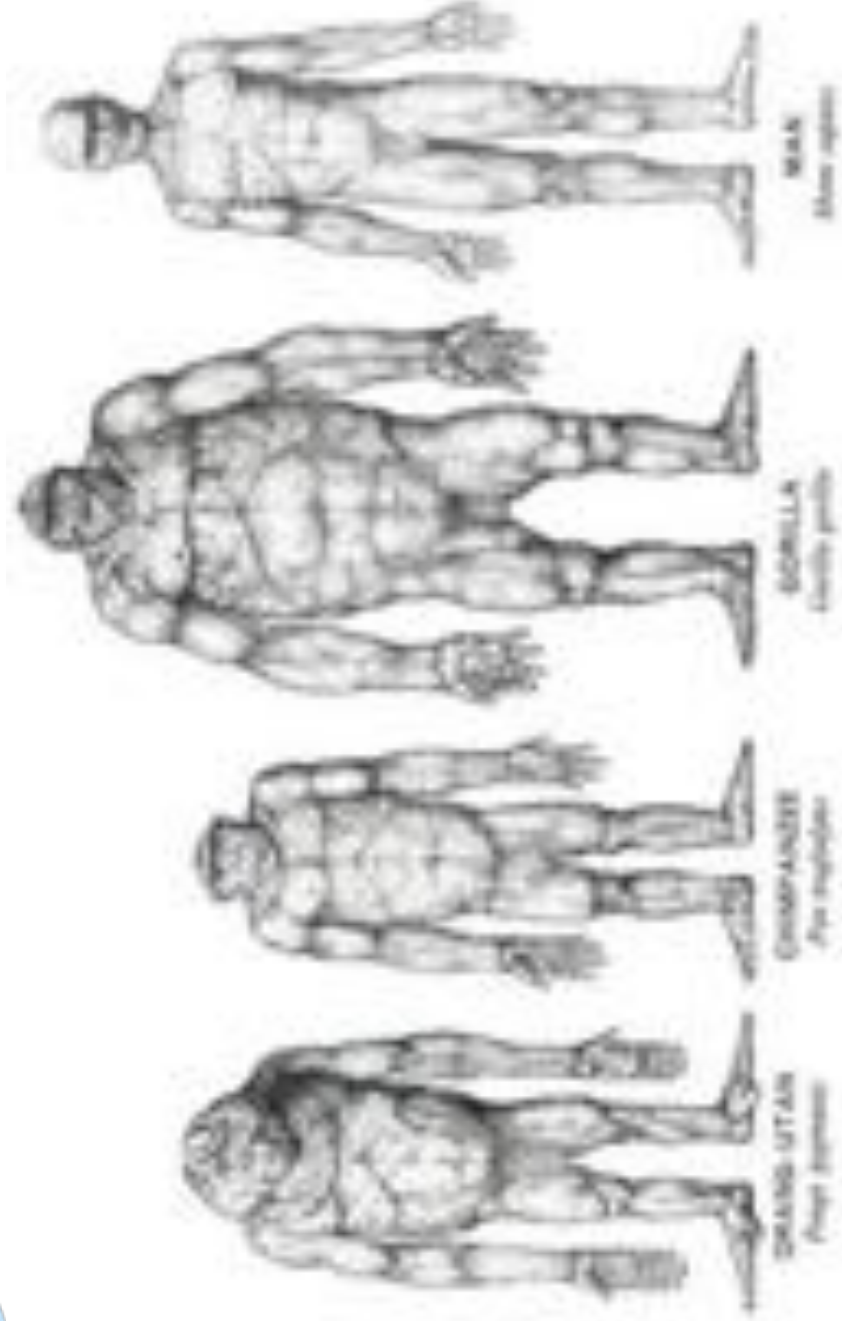


Laatste 3D echo technieken





Comparatieve anatomie



Gorilla's 98%

9 westerlijke laagland gorillas
1 zilverrug, 3 volwassen dames, 3 x 7 jarige mannen en 2 x 2jarigen





Chimpansees

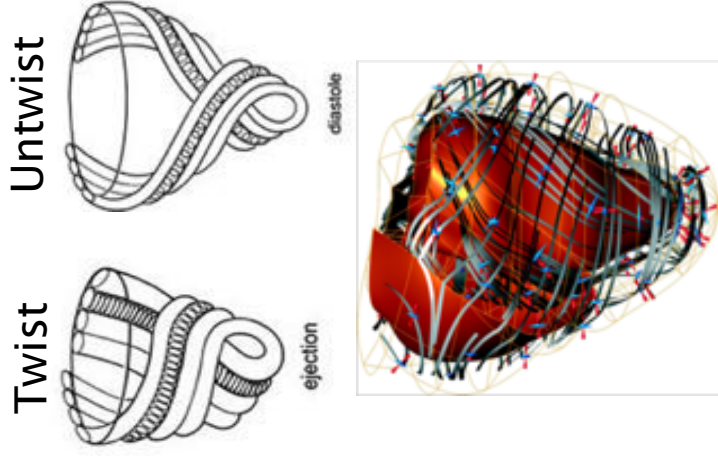
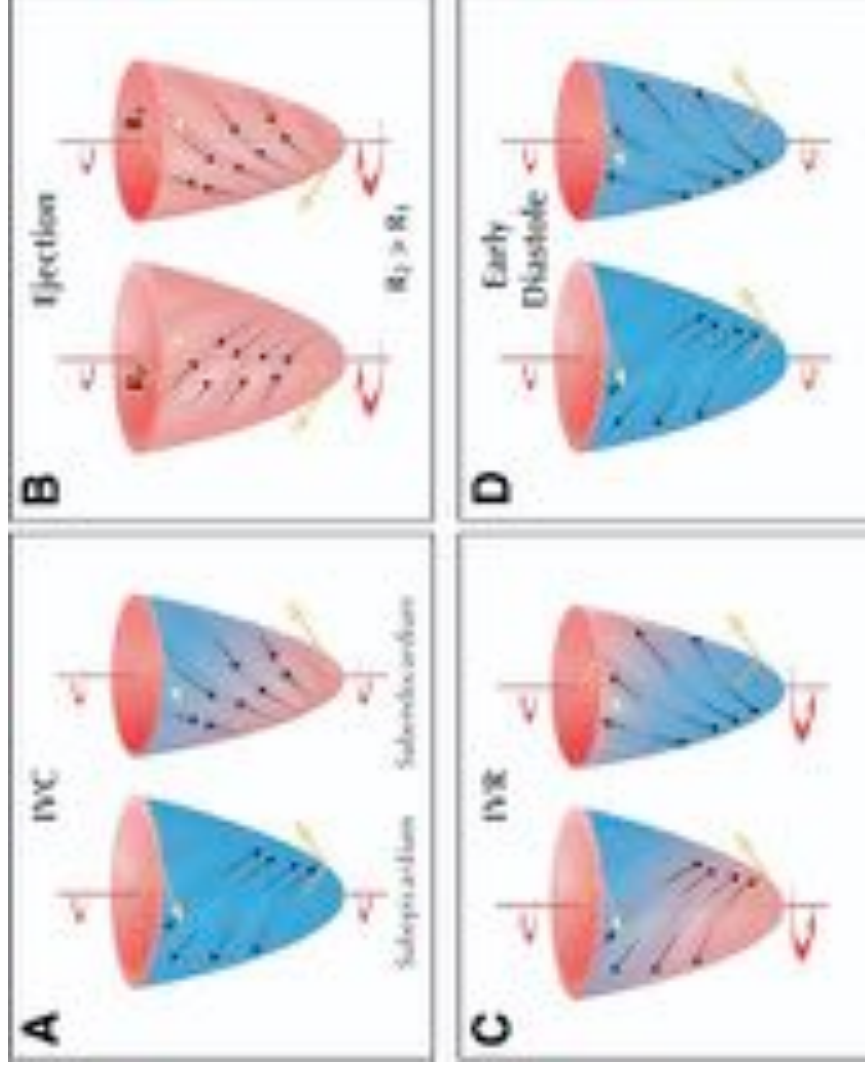
98.4%

9 chimpanzees: 3 mannen en 6 vrouwtjes.





Het zoogdier hart: een beproef concept...

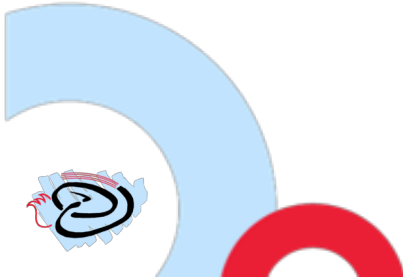


During untwist at IVRT:
 Generation of negative LV pressure



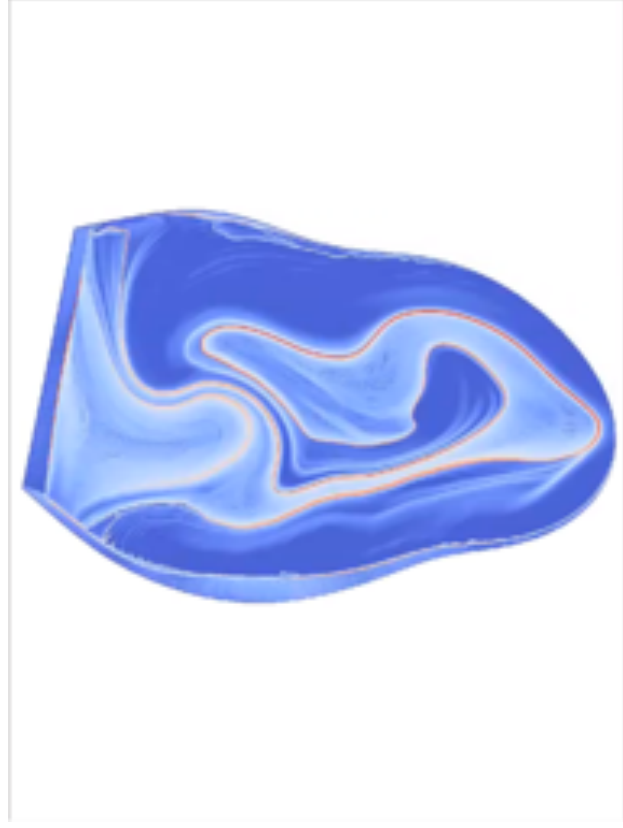
**Valvulaire anatomie
en
twist/untwist
genereert vortices**





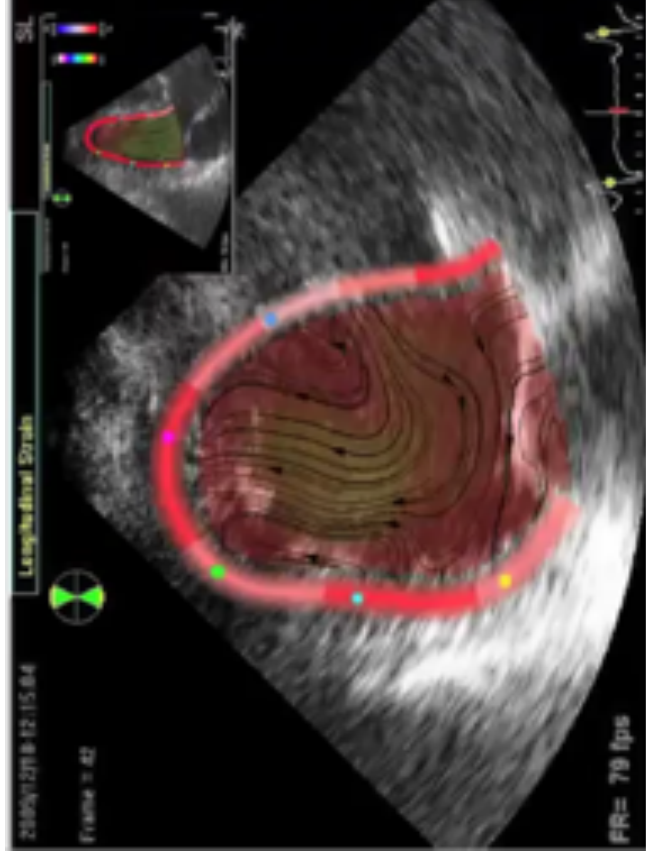
Intraventriculaire vortices (behoud van kinetische energie)

MRI derived model

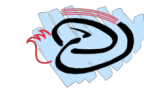


Normale vortices

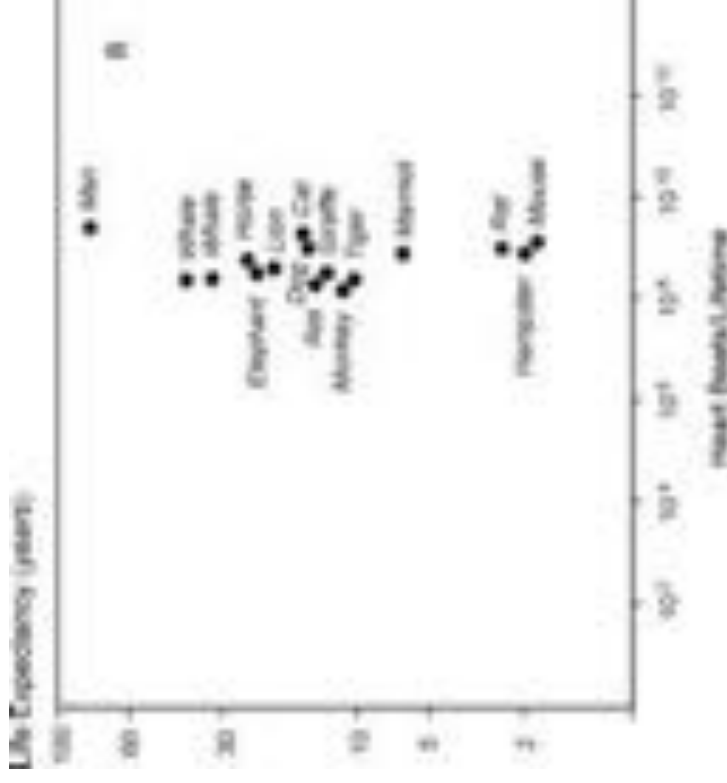
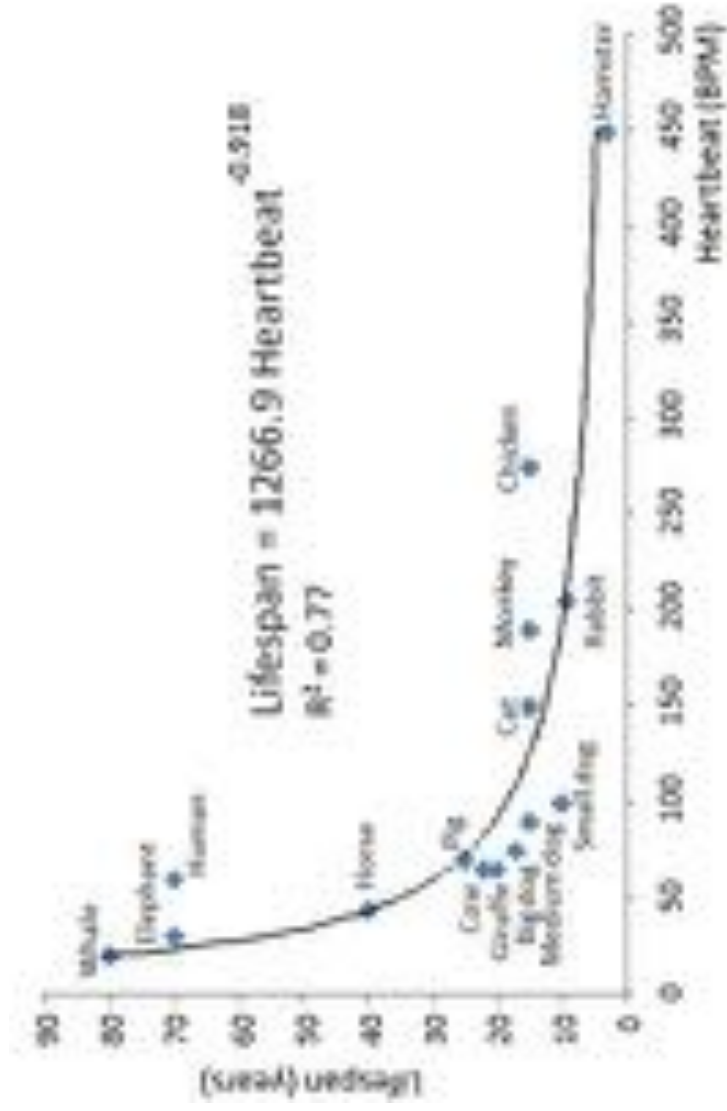
2D time-resolved flow mapping



Gestoorde vortices

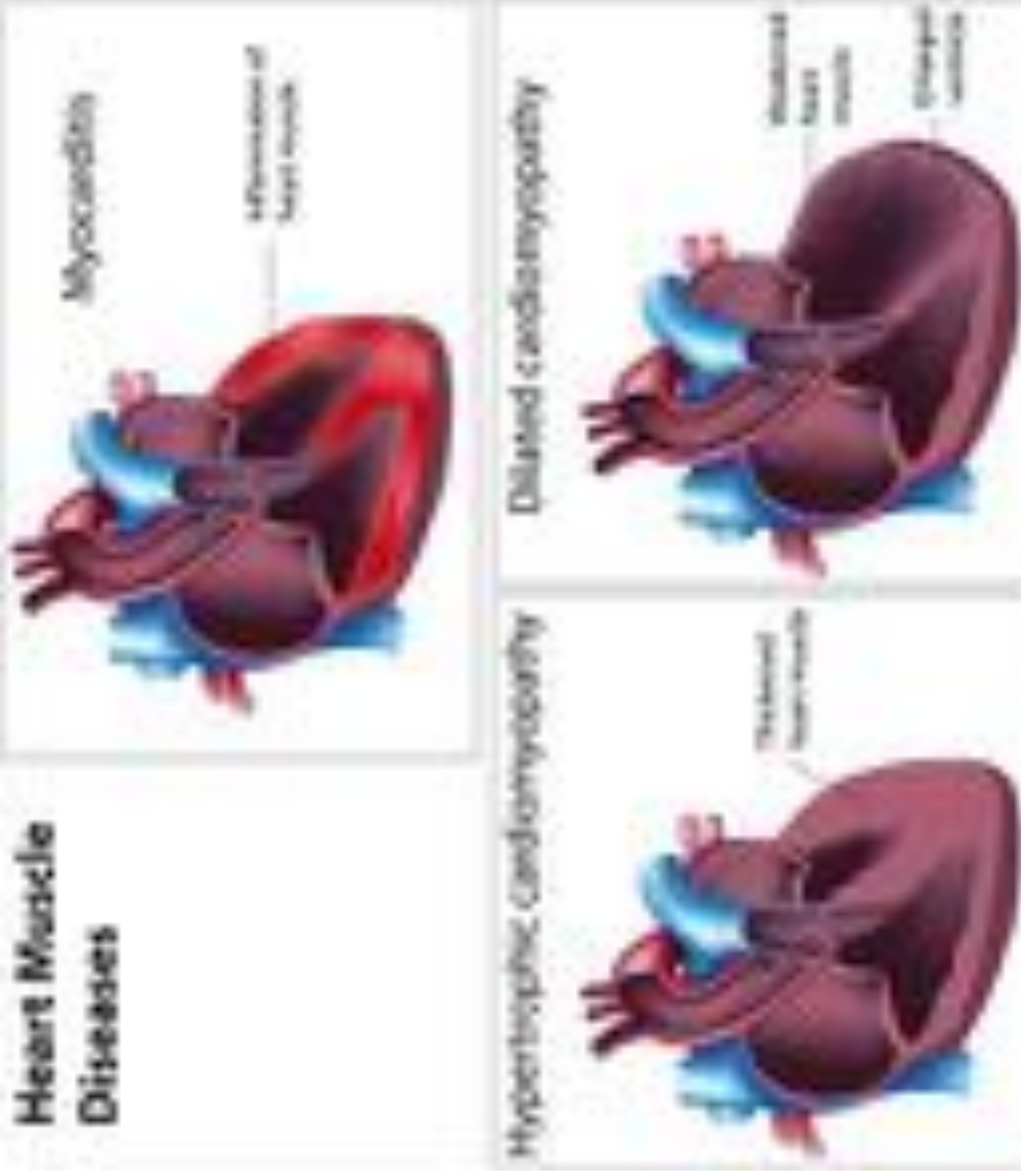


Lifespan en totaal aantal hartslagen tussen species



Pathologie primaten

Heart Muscle Diseases





niet voor humaan gebruik

Op spreekuur bij de cardioloog....in ARTIS!

18 JULI 2018
DOOR **BARBARA HUYGEN**



Sinds 4 jaar werken ARTIS en het OLVG nauw samen op het gebied van cardiologie en radiologie bij mensen met (hemp) Hersen en gort. Deze dienen zijn ook DNA voor 50% op mensen en dat betekent dat de 'human' geneeskunde op hen kan worden toegepast.

RECENSIE **VERHAAL** **INTERVIEW** **MUSIK**



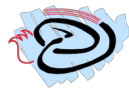
Podiumwerk in Paperback Radio met nieuwe Dichter des vaderlands Toesd Br-urje en Nikki Dekker



Wat leest Amsterdam? De Parool Boeken Top 10 nader toegelicht



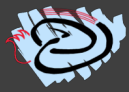
Club 87's interview met Grammy-nominatie singer-songwriter Doris Praetorius van Demitragroep Five Star



“Referentie” waarden primaten

ECHOCARDIOGRAPHIC PARAMETER	Males		Western Lowland Gorilla		Chimpanzee		Orangutan	
	n	d	n	d	n	d	n	d
Left ventricular diameter diameter (mm)	39-53	42-58	44 (34-53)	54 (33-73)	41 (36-56)	45 (33-59)	39	41
Inter-ventricular septum (mm)	4-12	4-13	12 (7-20)	14 (8-23)	10 (8-13)	10 (8-16)	6	4
Left ventricle posterior wall (mm)	4-12	4-13	11 (8-16)	14 (10-20)	9 (8-13)	8 (8-10)	4	3
Left ventricle diameter volume (ml)	36-104	47-133			71 (41-129)	74 (58-97)	38	70
Left ventricle specific volume (ml)	19-49	32-58			36 (22-48)	39 (31-50)	17	31
Relative wall thickness	<0.43	<0.43			0.44 (0.31-0.54)	0.43 (0.29-0.43)	0.26	0.27
Left ventricular specific fraction (%)	>55	>55	43 (34-62)	62 (39-80)	48 (27-63)	60 (49-71)	56	56

Table 1. Measures of left ventricular structure in great apes (means and range presented). Data taken from previous publications (Muller *et al.*, 2006; Lammey *et al.*, 2008) or as part of the ongoing Great Ape Heart Project + indicates data taken from Leung *et al.* (2005). * indicates data taken from Murphy *et al.* (2011). ** indicates data obtained as part of the International Primate Biometry Society Project. These values are not bracketed as “normal” reference ranges, rather as the only data that have been collected and study includes animals with pathology.



Wat is de norm?

Casus 1:

Gorilla Akili

Westelijke laagland gorilla (*Gorilla Gorilla Gorilla*)

- Lethargisch, alleen maar liggen
- Desinteresse, in zichzelf gekeerd
- At en dronk wel
- Minder dominant in de groep

Vraag: cardiomyopathie?

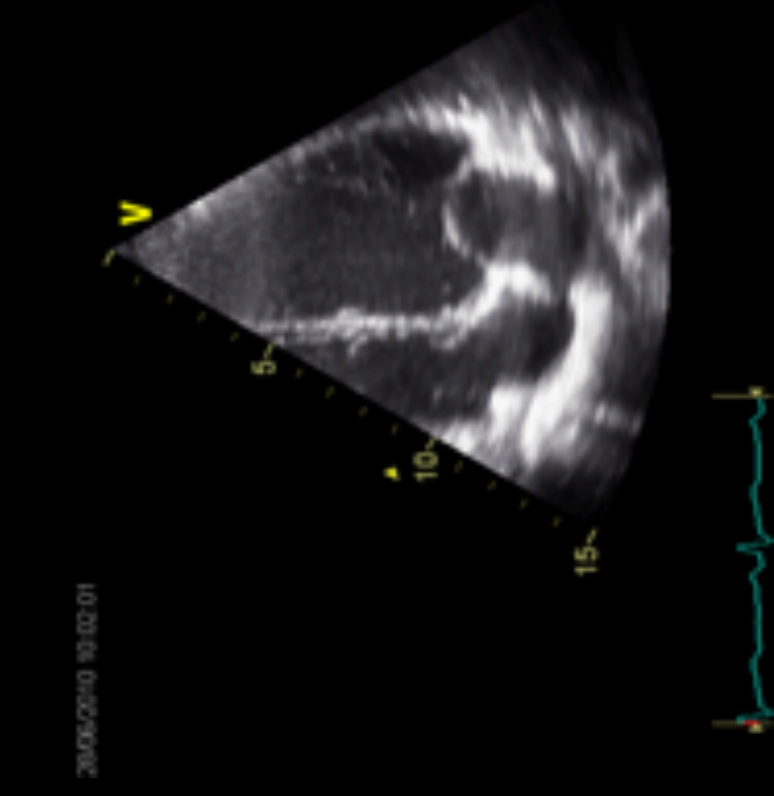




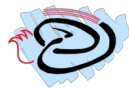
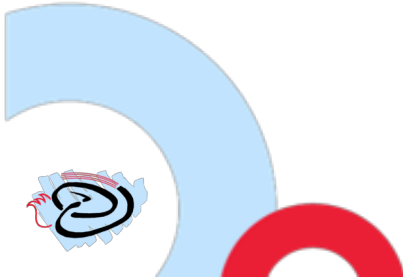
Echo onderzoek



Gorilla: EF 40%



Mens: EF 60%



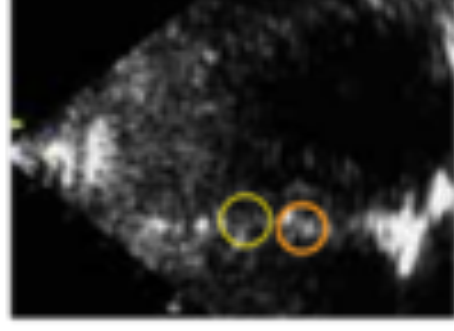
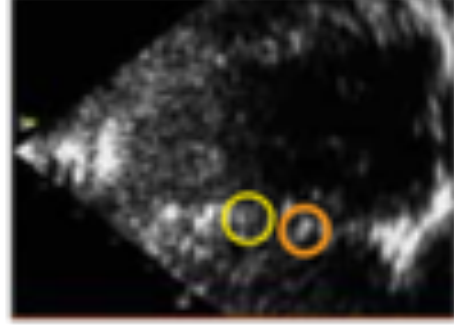
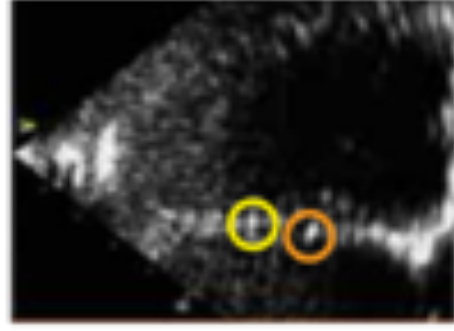
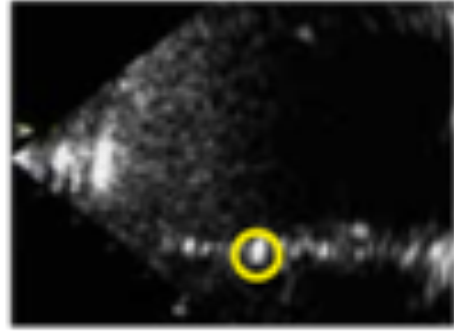
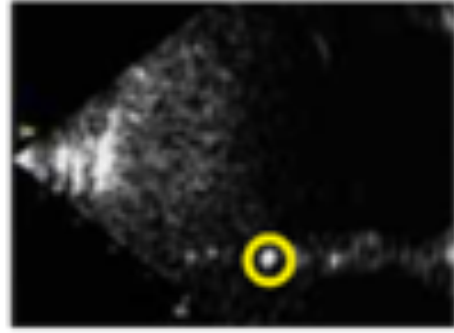
State of the art post-processing



Natural acoustic tagging

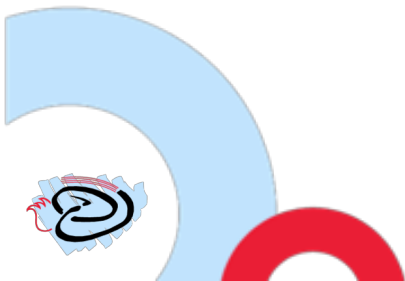
Speckle tracking pattern recognition algorithm

Myocardial deformational patterns

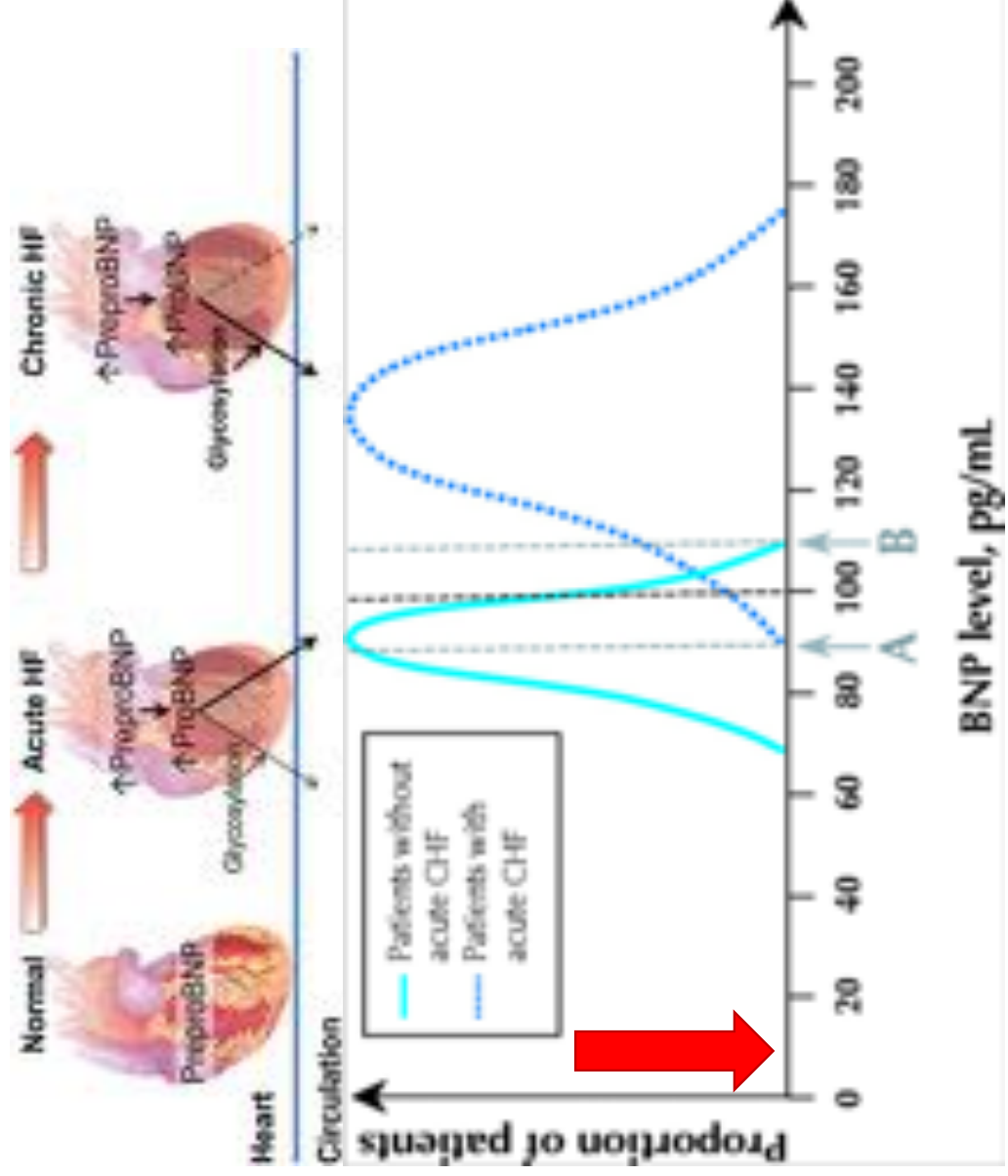


Time (sequential frames)

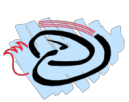




Cardiale hormonen:



Lab: NTproBNP 7



**THE GREAT APE
HEART PROJECT**
BASED AT ZOO ATLANTA

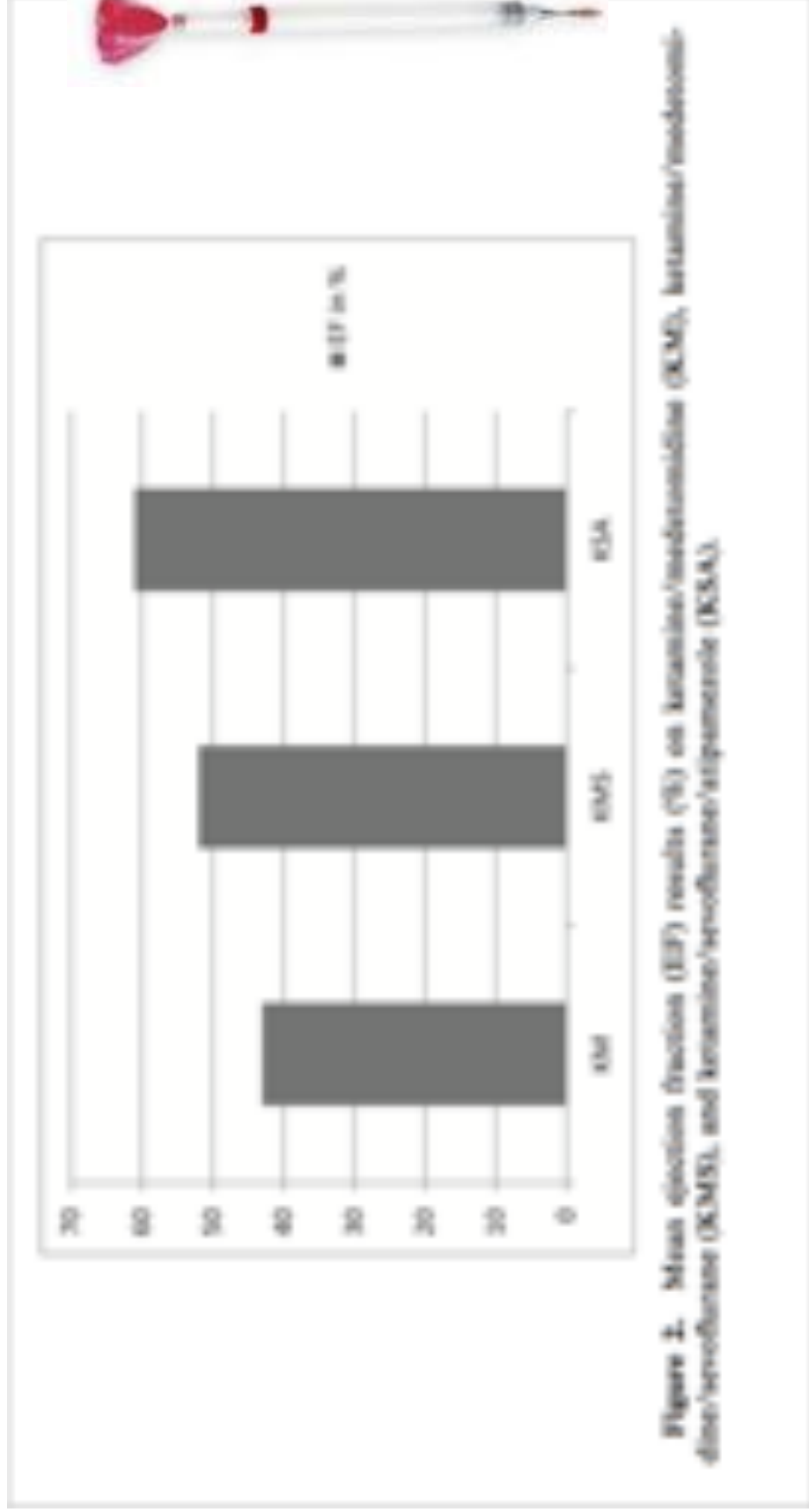


ARTIS





Verdoving en cardiale functie





Twee maanden later...op de mensen polikliniek van OLVG

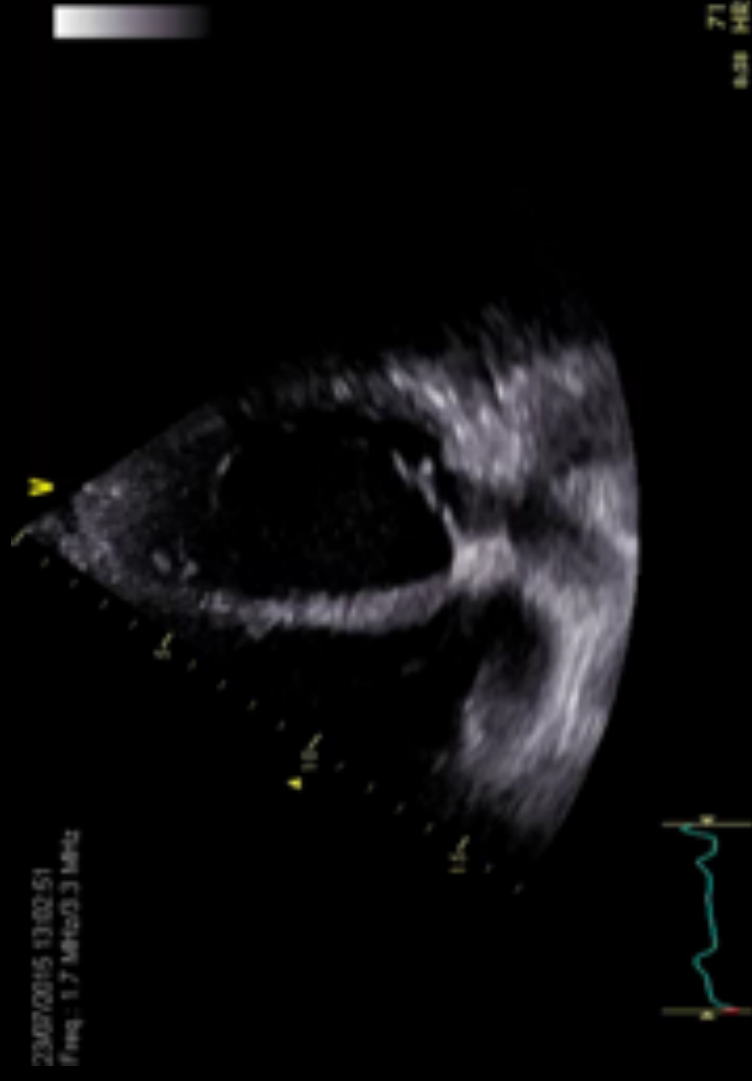
2nd opinion

Man 35 jaar

Vg Schizofrenie

Malaise en dyspnoe

R// Clozapine 400mg

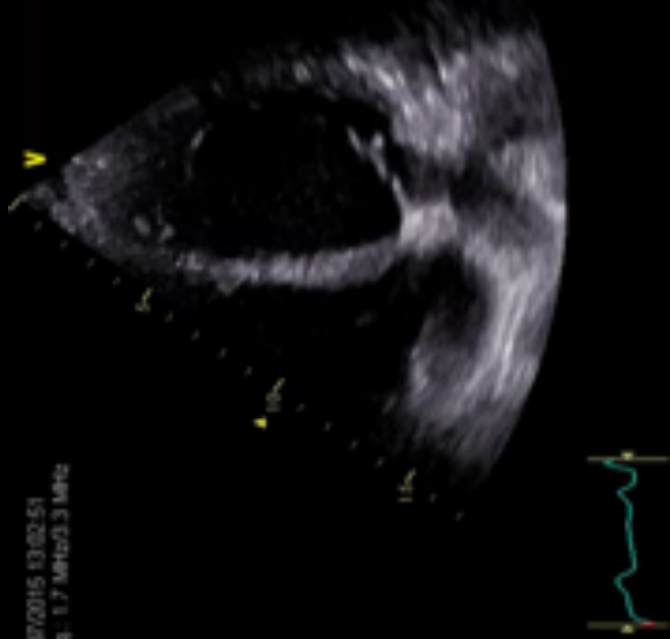


EF 40% NTproBNP 10

Zoek de overeenkomsten...

Medicamenteus geïnduceerde LV depressie

23/07/2015 13:02:51
Freq: 1.7 MHz@3.3 MHz



Mens: EF 40%

08/05/2015 11:20:29
Freq: 1.7 MHz@3.4 MHz



Gorilla: EF 40%

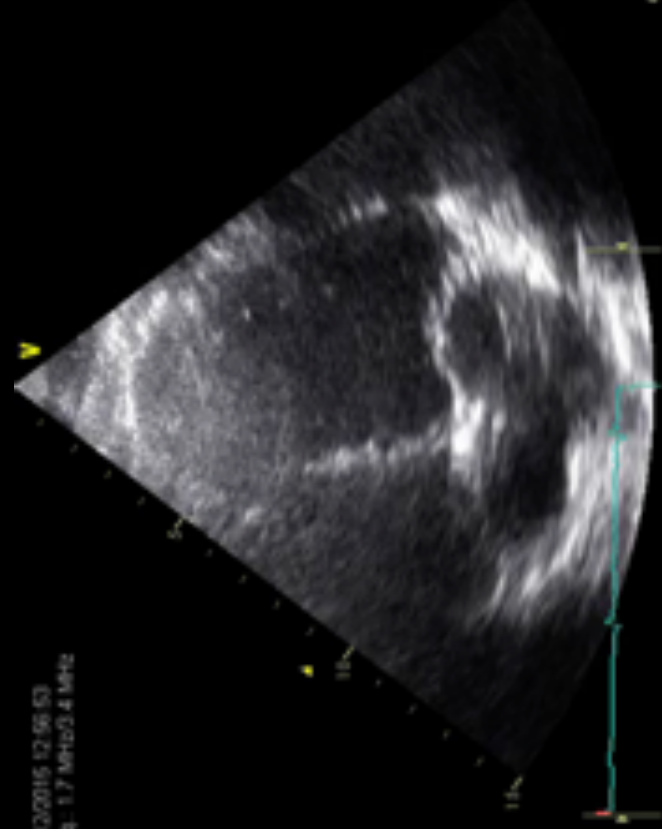
Casus 2: chimpansee vrouw - (*Pan troglodytes*)

- Chimpanse Saphira
- 24 jaar
- Futloos, slaapt de hele dag
- Verminderd eten en drinken
- Opgezwollen buik

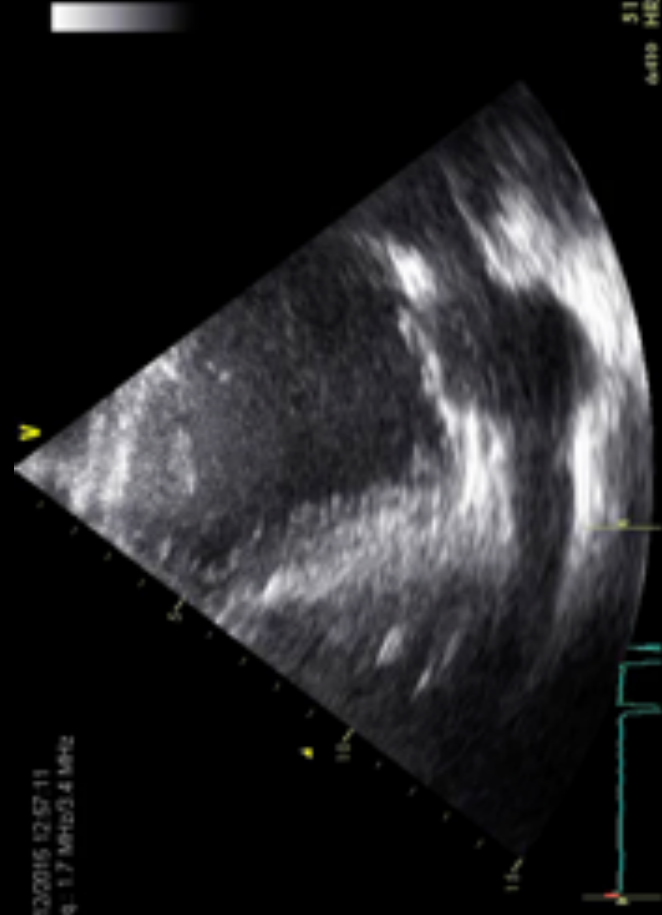


Echocardiogram

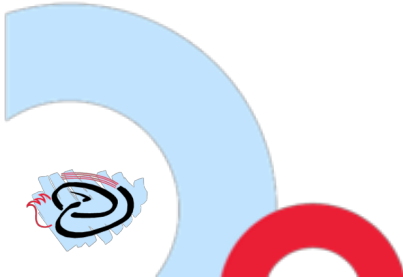
DA132015 12:56:53
Freq: 1.7 MHz/3.4 MHz



DA132015 12:57:11
Freq: 1.7 MHz/3.4 MHz



EF 40% (Normaal 50-60%)



Diagnose en beleid

ARTIS

Lab controle

CK 6710 u/L

Hs cTroponine T: 1.32 ug/L

NT proBNP 34 pmol/L

WBC $24.7 \times 10^9/L$

CRP 88 mg/L

Celdood in hartspier

Falen van de hartspier

Ontsteking

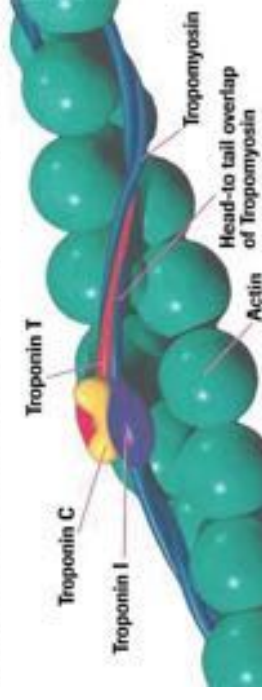
Beleid

Hartfalen medicatie:

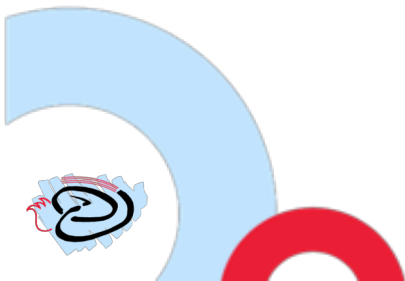
- Betablokker: carvedilol (voorkom ritmestoornis)
- ATII Antagonist: losartan (herstel kamerfunctie)

TROPONIN T

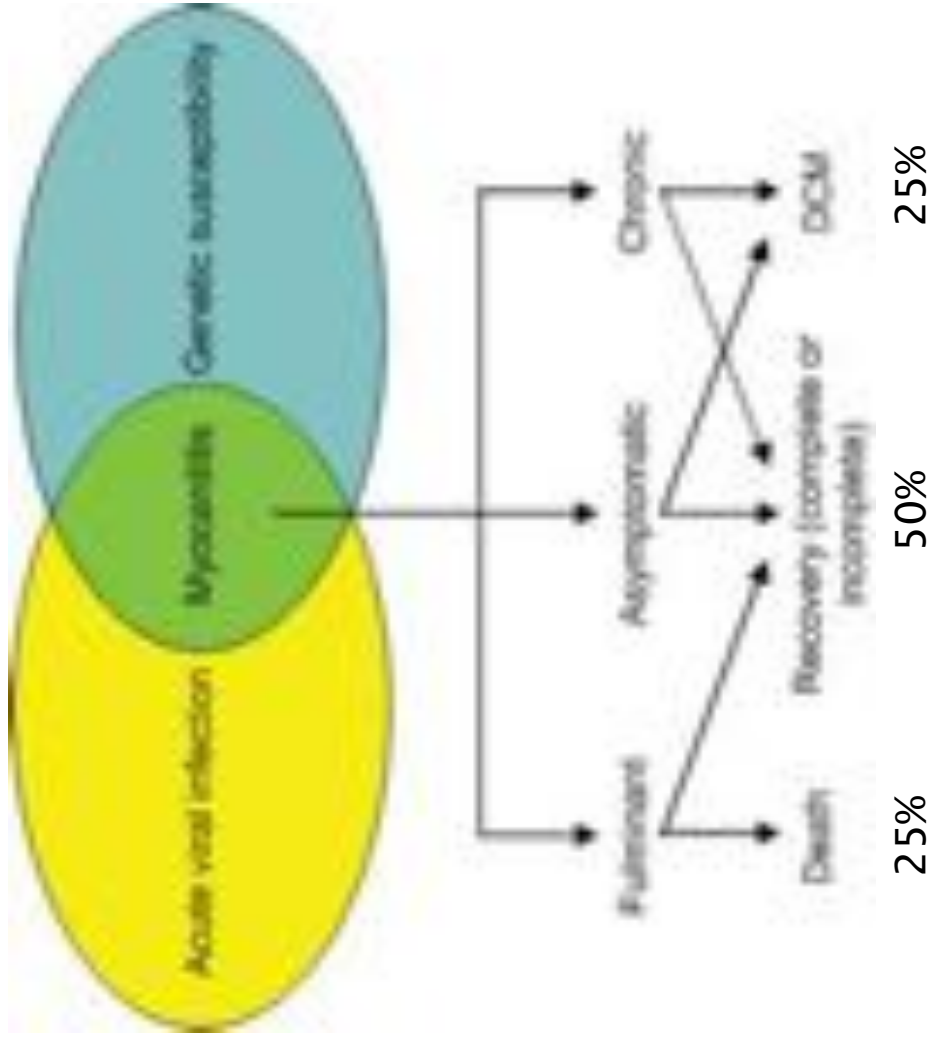
A regulatory protein released when cardiac cell necrosis occurs.



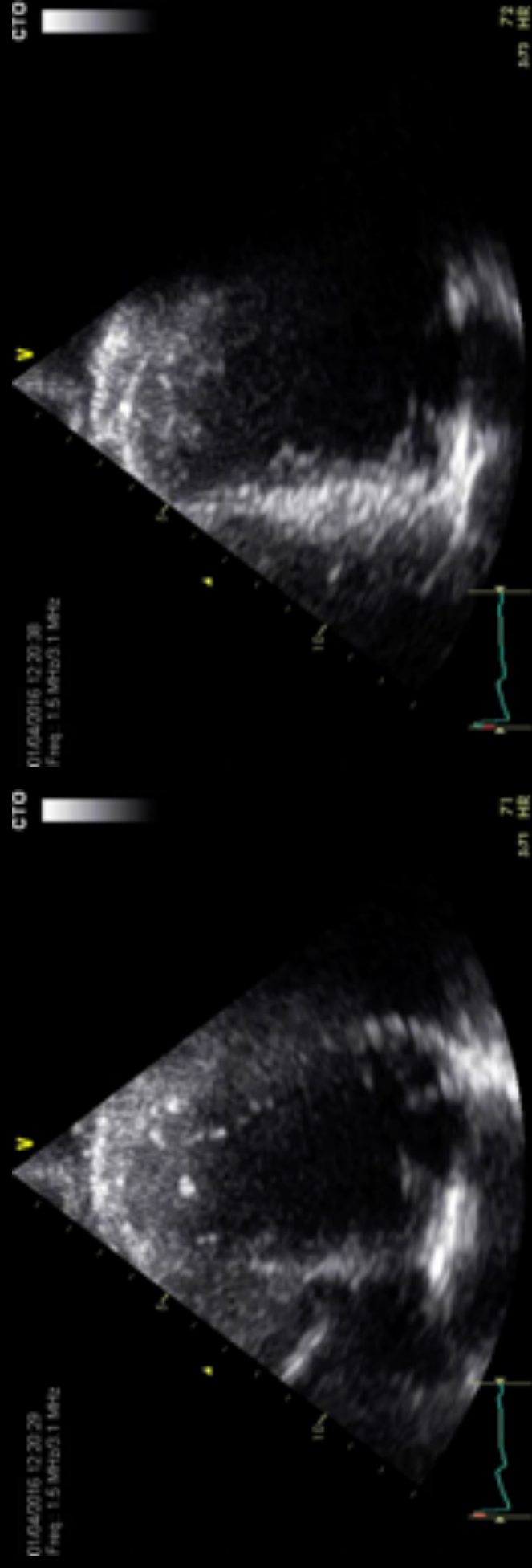
Diagnose: (virale) myocarditis



Pathogenese en prognose



Controle echo na 4 maanden



Normalisatie functie: EF 50%



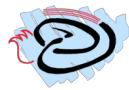
Vier maanden later...

ARTIS

TABLE 1: Summary statistics of the sample of respondents at baseline (N=111) and 4 months later (N=87) who received the intervention.

	Baseline (N=111)	4 months later (N=87)
Age (mean)	33	33
Female (%)	41	40
White (%)	68	67
Married (%)	52	51
Highly educated (%)	48	49
Workless (%)	12	11
Single parent (%)	11	10
Partner violence (yes) (%)	18	17
Partner violence (no) (%)	82	83
Partner violence (not sure) (%)	0	0
Partner violence (never) (%)	0	0
Partner violence (often) (%)	0	0
Partner violence (sometimes) (%)	0	0
Partner violence (not known) (%)	0	0
Partner violence (other) (%)	0	0





Vier maanden later...



CASE REPORT

Clinical signs, diagnostics and successful treatment of a myocarditis in an adult chimpanzee (*Pan troglodytes*)

Martine van Zijl Langhout , Marna Wolters, Kaslin M. Horvath, Harold Thiesbrummel, Paul Smits, Hester van Belhuis, Victor van der Hurst, Robert Riezić-Bos

First published: 15 May 2017 | <https://doi.org/10.1111/jmp.12273>

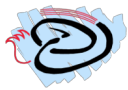
Conclusie:

- Geen actieve myocarditis meer
- Herstel cardiale functie
- Medicatie gestopt
- Sindsdien 100% in orde

TABLE 1 (Continued)

	4 December 2015	1 April 2016	Reference interval ^a	Unit
Rate	68 bpm	75 bpm		
Systemic function LV+RV	Moderate	Normal		
Dilation or hypertrophy	No	No		
Normal LA dimension	Yes	Yes		
Aortic valve insufficiency	Grade 1	Grade 1		
LVEF	41%	50%		
Pericard effusion	No	No		

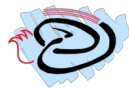
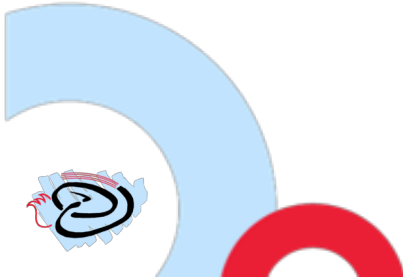
^aStandard International Units 2013, ISIS. Physiological Reference Intervals for captive wildlife: A CD-ROM Resource. Species360, Bloomington, MN. Human reference interval: HKCL, OLVG, Amsterdam, the Netherlands.



Casus 3: chimpanzee Leen, vrouw, 37 jaar

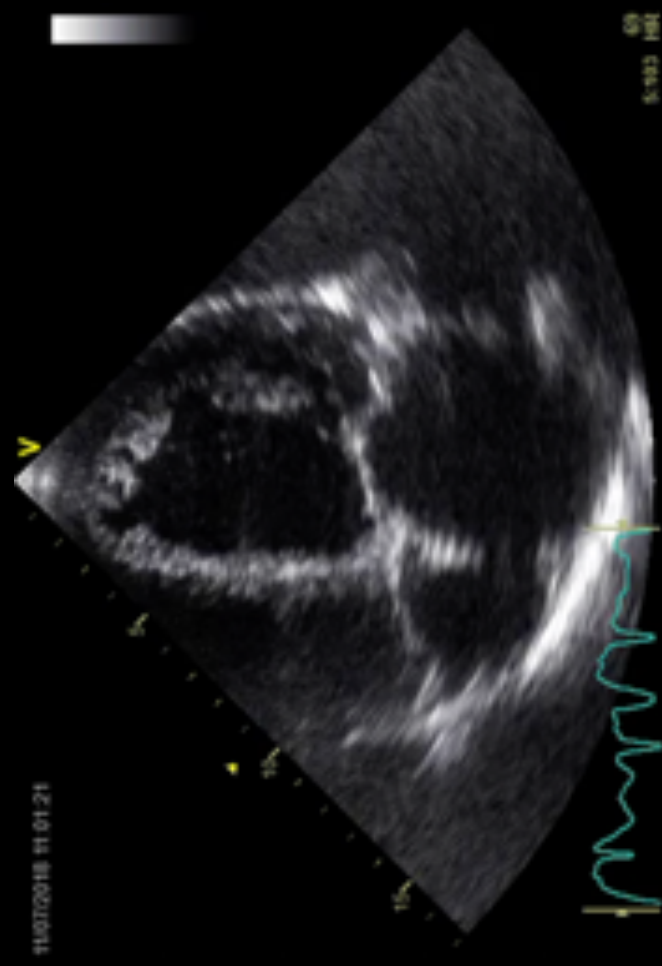
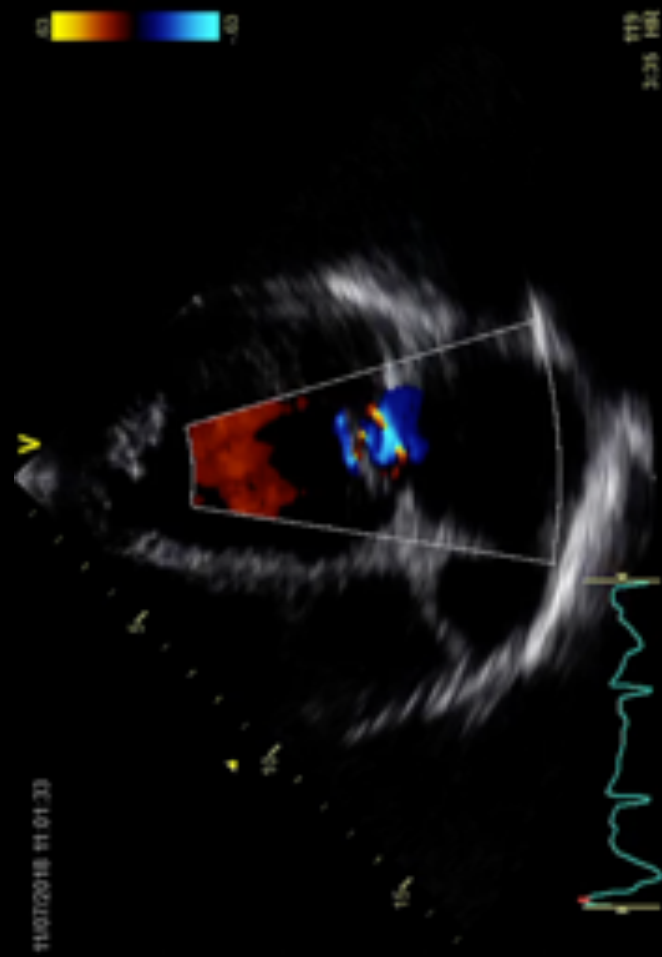
- 13/6: Lethargisch, zware ademhaling. Gestart met furosemide 80mg BID
- 18/6: Sterk verbeterd. Afbouwen furosemide naar onderhoudsdosering.
- 29/6: Opeens zeer benauwd en ascites. Ondanks hoge dosis furosemide achteruit.
- 1/7: Gestart met: 5mg Lisinopril SID, 5mg Bumetanide SID en 25mg Spironolacton SID.
- 11/7: Verdoving (aangepast), klinisch onderzoek, echo hart en abdomen, bloedafname.

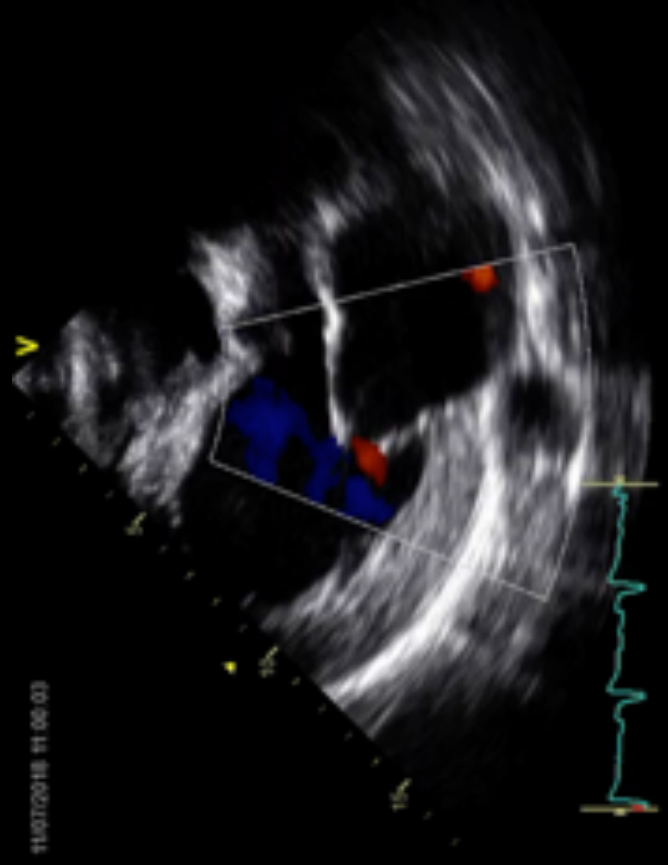


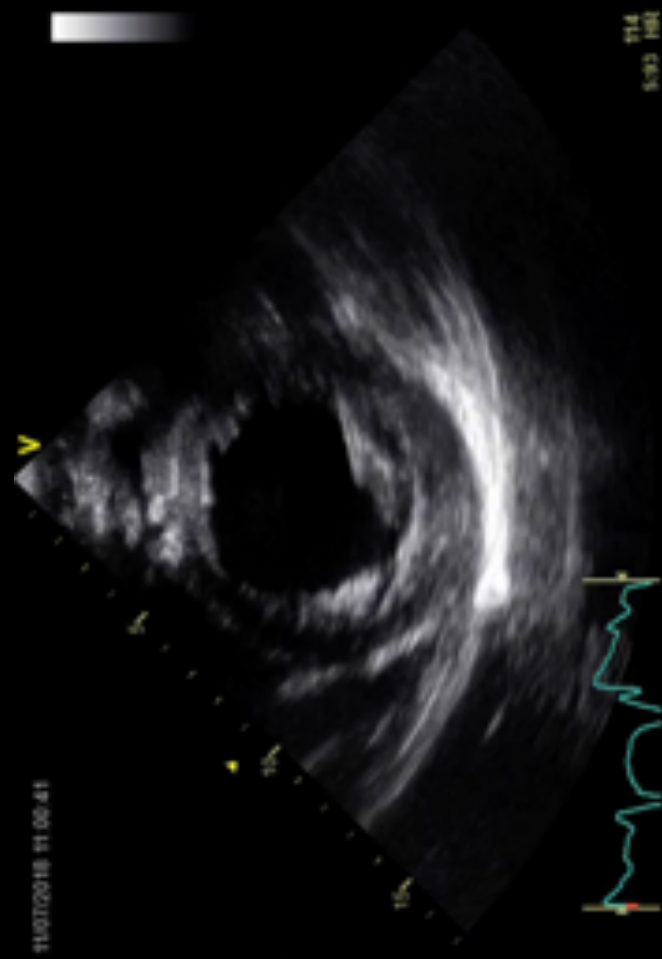
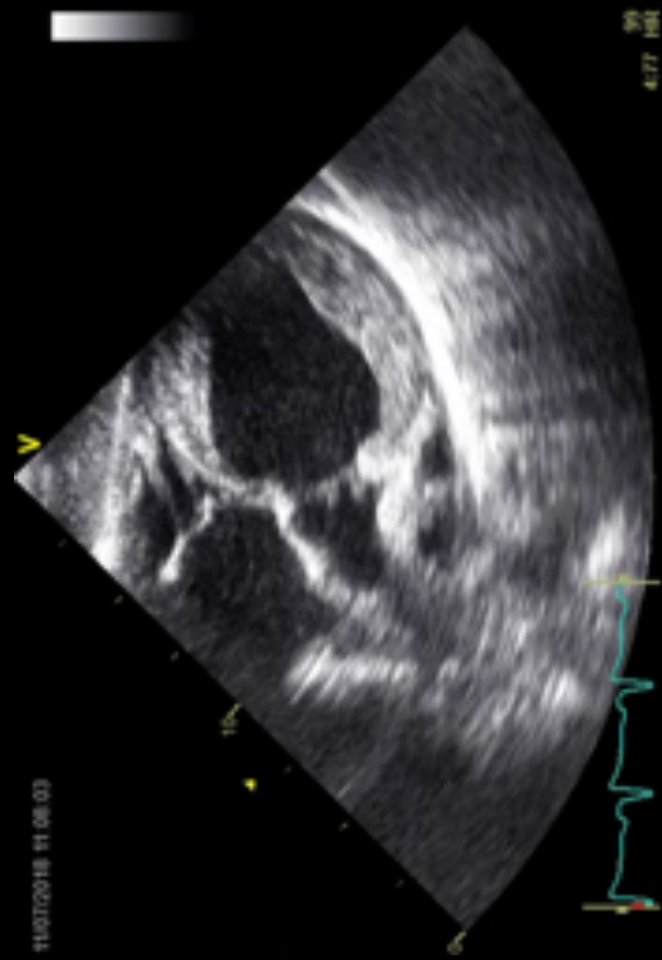


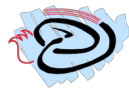
Dyspnoe d'effort











Diagnostiek en diagnose

Bloedsuitslagen:

Na 145 mmol/l

K 3.2 mmol/l

Kreat 108 umol/l

Ur 7.0 mmol/l

Hs Troponine T 0.120 ug/l (< 0.014)

NT proBNP 1720 pmol/l

CK 61 U/l

Conclusie:

Ernstige (fibroserende) cardiomyopathie

LVEF 15%, matige mitralisklep
insufficiëntie


Medicatie aangepast:

Bumetadine 2mg SID

Spirinolacton 50mg SID

Carvedilol 3.125mg BID

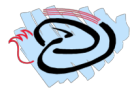
Lisinopril 5mg SID

- 
- Nu 90% de oude
 - Levenslang medicatie
 - Neemt medicatie goed

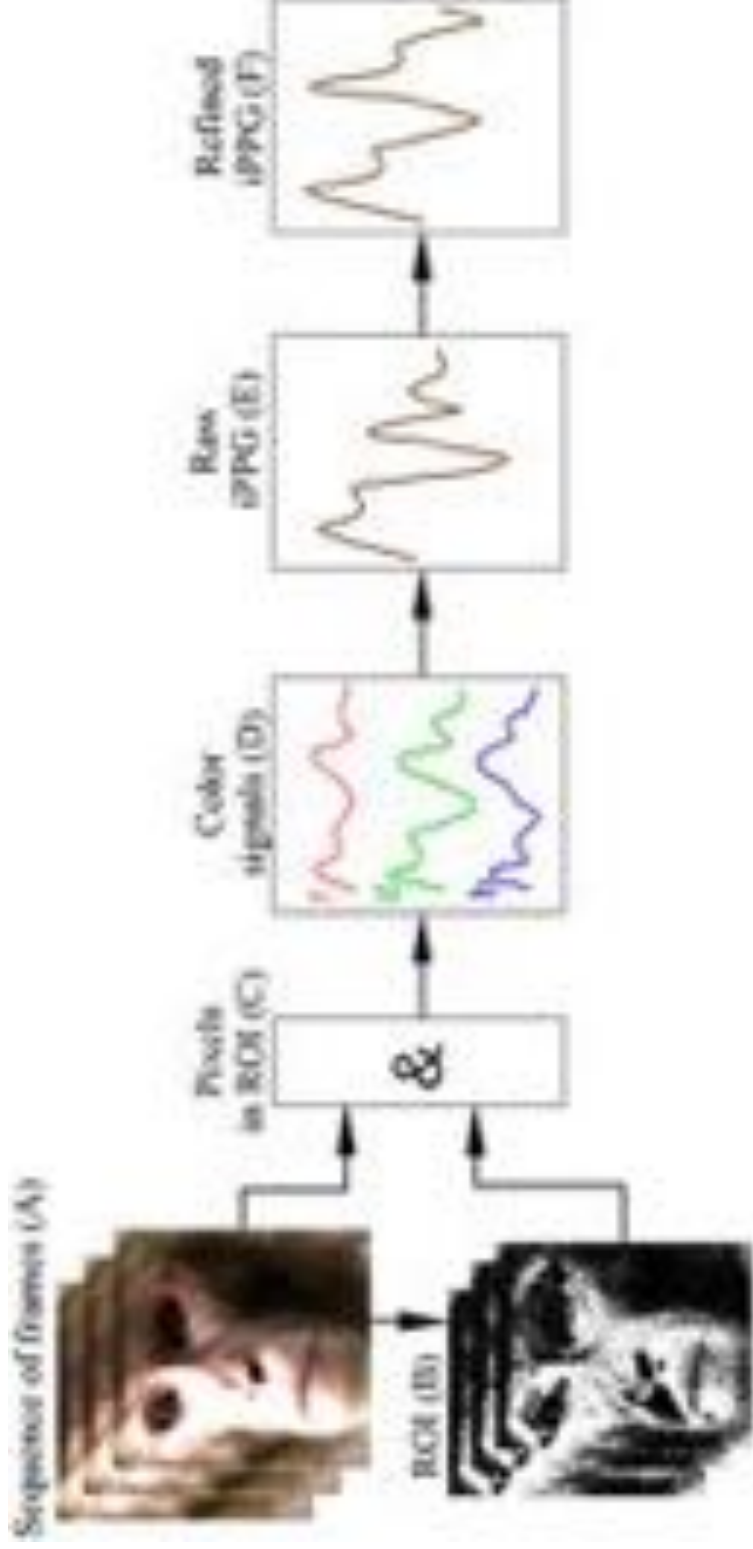


Titreeren van hartfalen medicatie, bloeddruk en hartfrequentie....

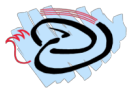




Hartfrequentie via video: iPPG



Unakafov AM, Möller S, Kagan I, Gail A, Treue S, et al. (2018) Using imaging photoplethysmography for heart rate estimation in non-human primates. PLOS ONE 13(8): e0202581 . <https://doi.org/10.1371/journal.pone.0202581>
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0202581>



Epidemiologie

	Humaan	Chimpansee
Myocarditis		
Incidentie	7:1 000 000	1:30 (artis)
Prevalentie	1:2 500	1:2 (berekend)
Cardiomyopathie (DCM)		
Incidentie	1:360	1:7 (berekend)
Prevalentie	1:100	1:2*

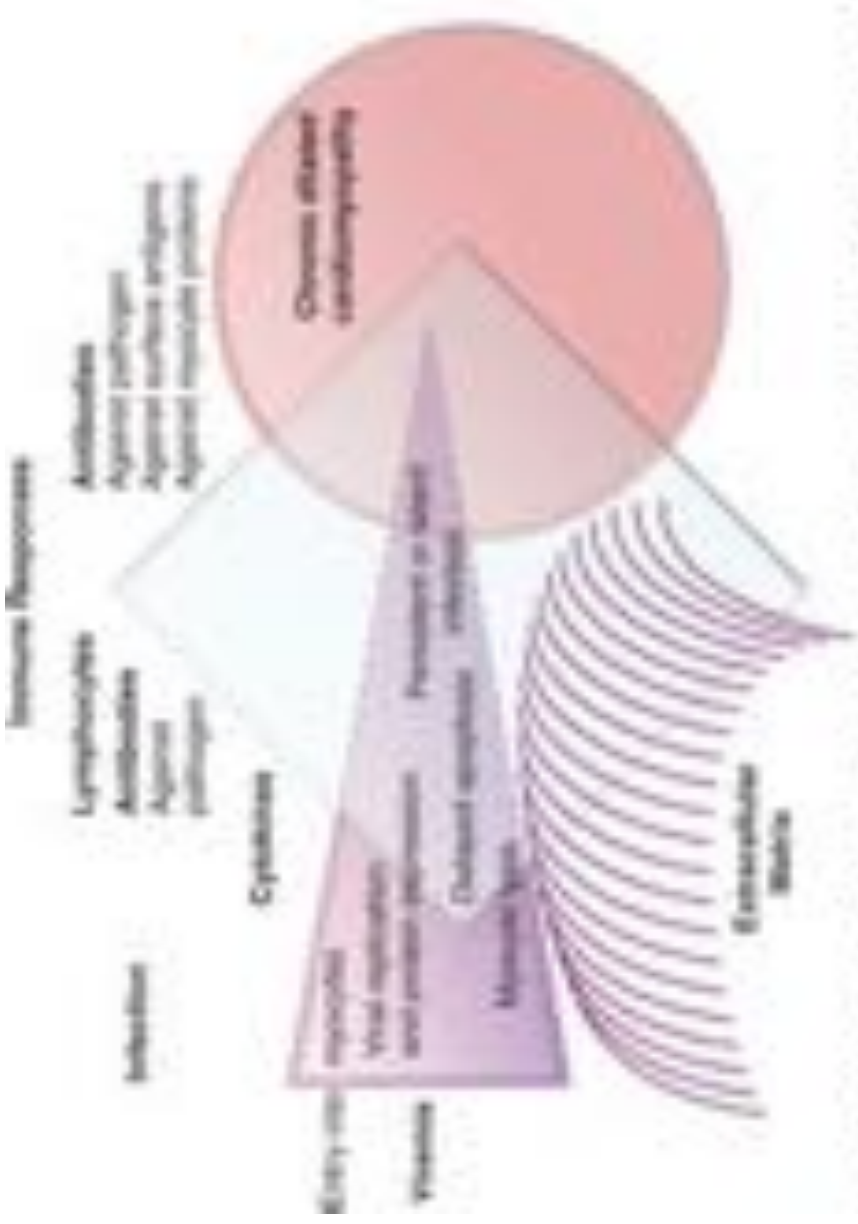
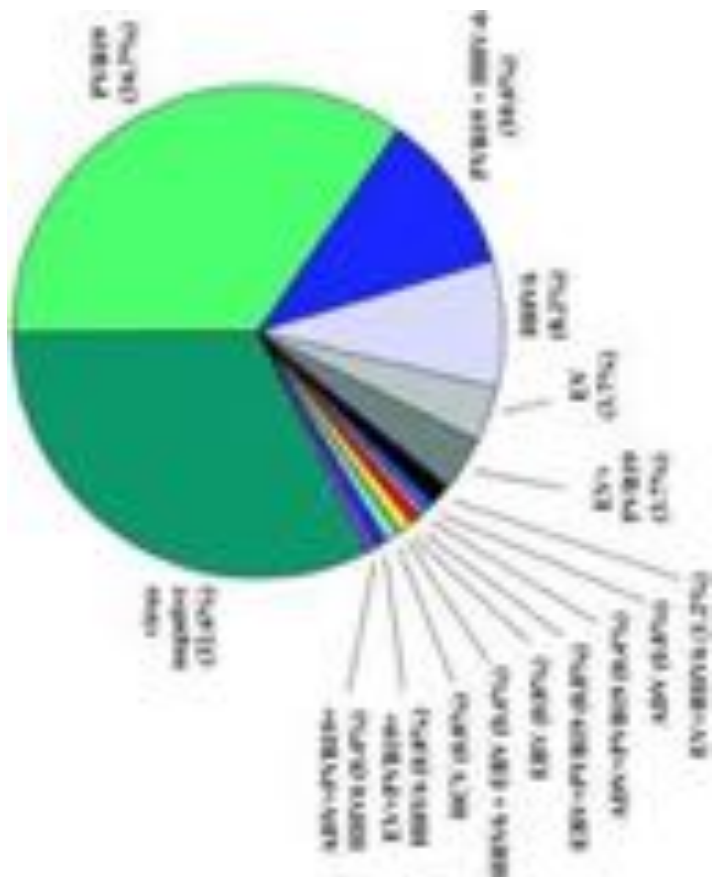
Een dergelijk hoge incidentie/prevalentie van hartziekten is evolutionair moeilijk te duiden

Genetische selectie
Immunologische gevoeligheid
Externe noxen



Myocarditis bij NHP: een antropozoönose?

Oorzaken virale myocarditis bij de mens



Conclusies

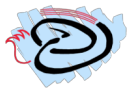
- Treffende overeenkomst in cardiale anatomie en pathologie bij non-human primates (NHP).
- Slechts basale, descriptieve, wetenschappelijke informatie over NHP voorhanden.
- Hartziekten komen frequent voor bij NHP en zijn verantwoordelijk voor sterfte.
- Routine screening belangrijk bij wilde diersoorten omdat ze symptomen lang verbergen.
- De kwaliteit van medische zorg en levensverwachting van mensapen gaat omhoog.
- Cardiomyopathie en myocarditis lijken te clusteren binnen dierentuin populaties.
- *De oorzaak is nog onduidelijk*



The thinker monkey

Banksy

- Samenwerking biedt een verfrissend nieuw perspectief op de humane en de diergeneeskunde.
- Overeenkomsten tussen mens en dier worden inzichtelijk.



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